Appendix G
Meade Heights Stream Survey

DRAFT REPORT

Middletown Airfield Site
Middletown, Pennsylvania

Meade Heights Stream Survey Supplemental Studies Investigation

1 July 1996

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EXECUTIVE SUMMARY

The Meade Heights stream survey, conducted during May 1994, was an aquatic biological investigation of a small unnamed tributary to the Susquehanna River. This unnamed tributary drains a portion of the Middletown Airfield NPL Site and bordering properties. The stream survey was performed at four different sampling stations on the Meade Heights Tributary, beginning near its headwaters and proceeding downstream to its mid reaches. The lower section of the stream is piped for a major portion of its length through the Harrisburg International Airport, and was not surveyed. The assessment included a habitat characterization, water and sediment chemistry analyses, and an assessment of the benthic macroinvertebrate and fish communities.

The stream survey were drawn from the following conclusions:

- stream flow during the survey period, which provide dilution, was very low, reflecting "worst case" conditions;
- analyses of surface water samples indicated moderate hardness values and relatively low levels of metals; total dissolved solids were slightly elevated; and no organic compounds were detected;
- sediment chemistry indicated low levels of several volatile and semi-volatile compounds; one pesticide, DDD was detected at low concentrations; and metals were detected at relatively low concentrations;
- although the watershed was relatively developed, the stream corridor was forested;
- stream habitat was generally poor due to the sandy substrate which provided little optimum habitat for aquatic life; and high stream velocities which erode stream banks and probably reach substrate scouring velocities during storm events;
- the benthic macroinvertebrate community was limited in diversity and abundance at all stations surveyed, with relatively pollution-sensitive species present at all stations; the poorly developed benthic macroinvertebrate community was likely caused by the intermittent nature of flow and the poor habitat conditions which are inherently stressful to benthic macroinvertebrates; and

- the fish community was limited to two species of minnows, both common to small streams; the limiting factor to fish appeared to be poor habitat quality.

Overall, good water and sediment chemical quality was indicated by the assessment of the aquatic community. Habitat quality appears to be the major limiting factor to the aquatic community.

G.1 INTRODUCTION

G.1.1 BACKGROUND

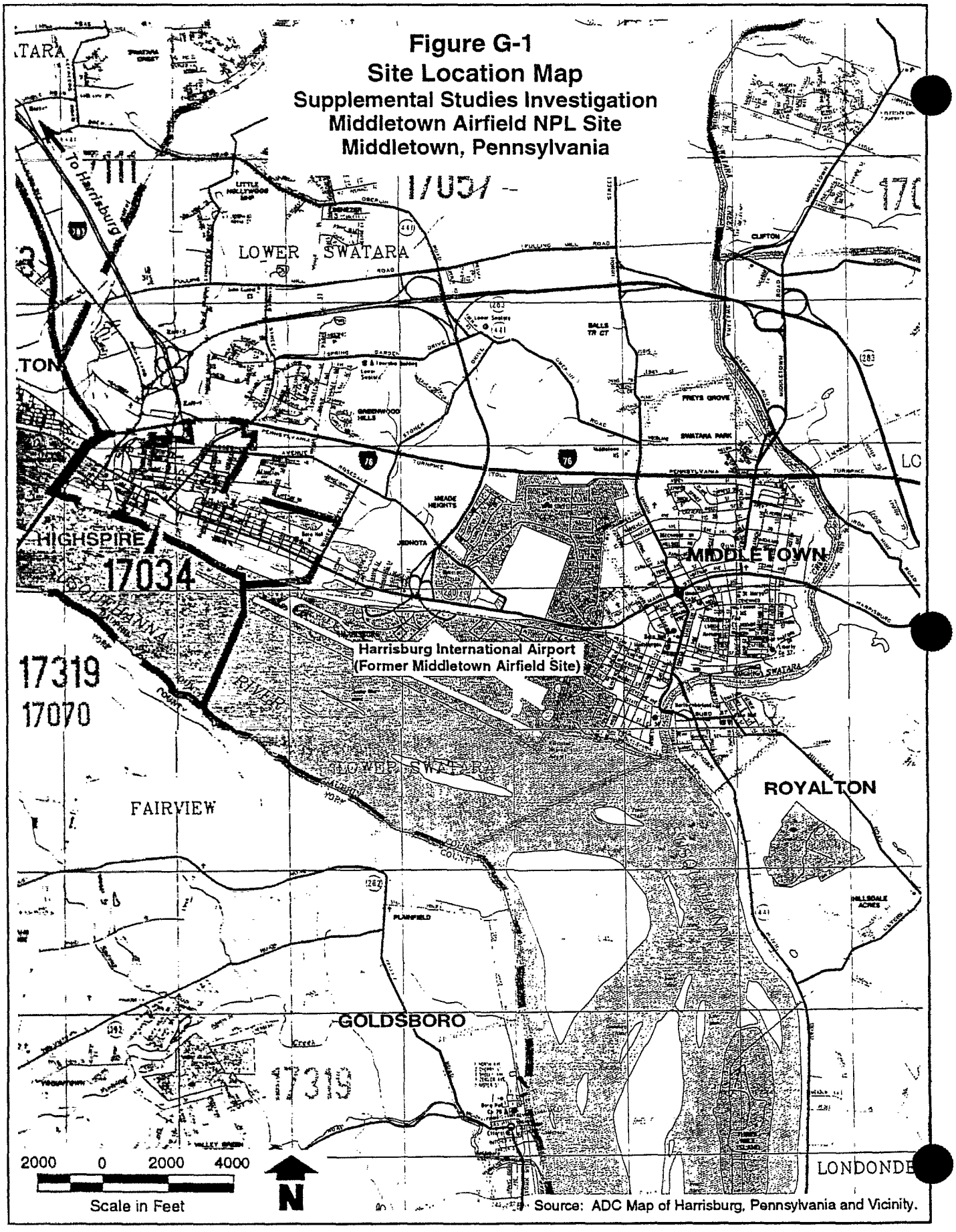
The Middletown Airfield NPL Site (the "Site") is located in West Swatara Township, Dauphin County, near Harrisburg, Pennsylvania (see Figure G-1). A small unnamed tributary flows through the Site near its western boundary and to the east of a housing complex referred to as Meade Heights. This unnamed tributary will be referred to as the Meade Heights Tributary in this report. This tributary is a first to second order tributary and is piped through the Harrisburg International Airport (HIA) directly to the Susquehanna River just north of PA Route 230.

Currently, there are no known point source discharges to the Meade Heights Tributary upstream of HIA; however, the tributary receives off-Site drainage from the Pennsylvania Turnpike upstream of the Site, but just downstream of its northern origin. Stormwater runoff from a former industrial/commercial area just south of the Turnpike also drains to the tributary. Site drainage downstream of the Turnpike and upstream of Route 230 crossing also exists and includes storm runoff from various access roads, the Meade Heights housing area and Pennsylvania State University, Capital Campus parking lots. The stream corridor is forested with riparian vegetation common to Central Pennsylvania.

Downstream of Route 230 the tributary is piped underground, although it is present as a drainage ditch in some areas through the lower HIA property. This lower section of the tributary was not investigated by this stream survey. The Meade Heights Tributary and the Susquehanna River are classified as warm water fisheries (WWF) waters by the Pennsylvania Department of Environmental Protection (PADEP).

The Meade Heights stream survey was conducted on May 1, 12, 13 and 24 1994 by a team of two aquatic biologists. Four stream locations, referred to as stations, were chosen on the upper and middle reaches of the stream and deemed representative of existing conditions. The sampling team conducted a benthic macroinvertebrate and fish survey and collected water and sediment samples in accordance with approved project work plans and the U.S. Environmental Protection Agency's (USEPA) manual

Figure G-1
Site Location Map
Supplemental Studies Investigation
Middletown Airfield NPL Site
Middletown, Pennsylvania



Source: ADC Map of Harrisburg, Pennsylvania and Vicinity.

entitled *"Rapid Bioassessment Protocols For Use in Streams and Rivers - Benthic Macroinvertebrates and Fish"* (1989).

G.1.2 OBJECTIVES

The objective of this bioassessment was to obtain information on the nature of the aquatic community, including:

- identification of the biological composition of benthic and fish communities within Meade Heights Tributary; and,
- determination of the relative physical, chemical and biological quality of Meade Heights Tributary.

The following sections present the methods, results and conclusions of the bioassessment.

G.2 TECHNICAL APPROACH

G.2.1 GENERAL

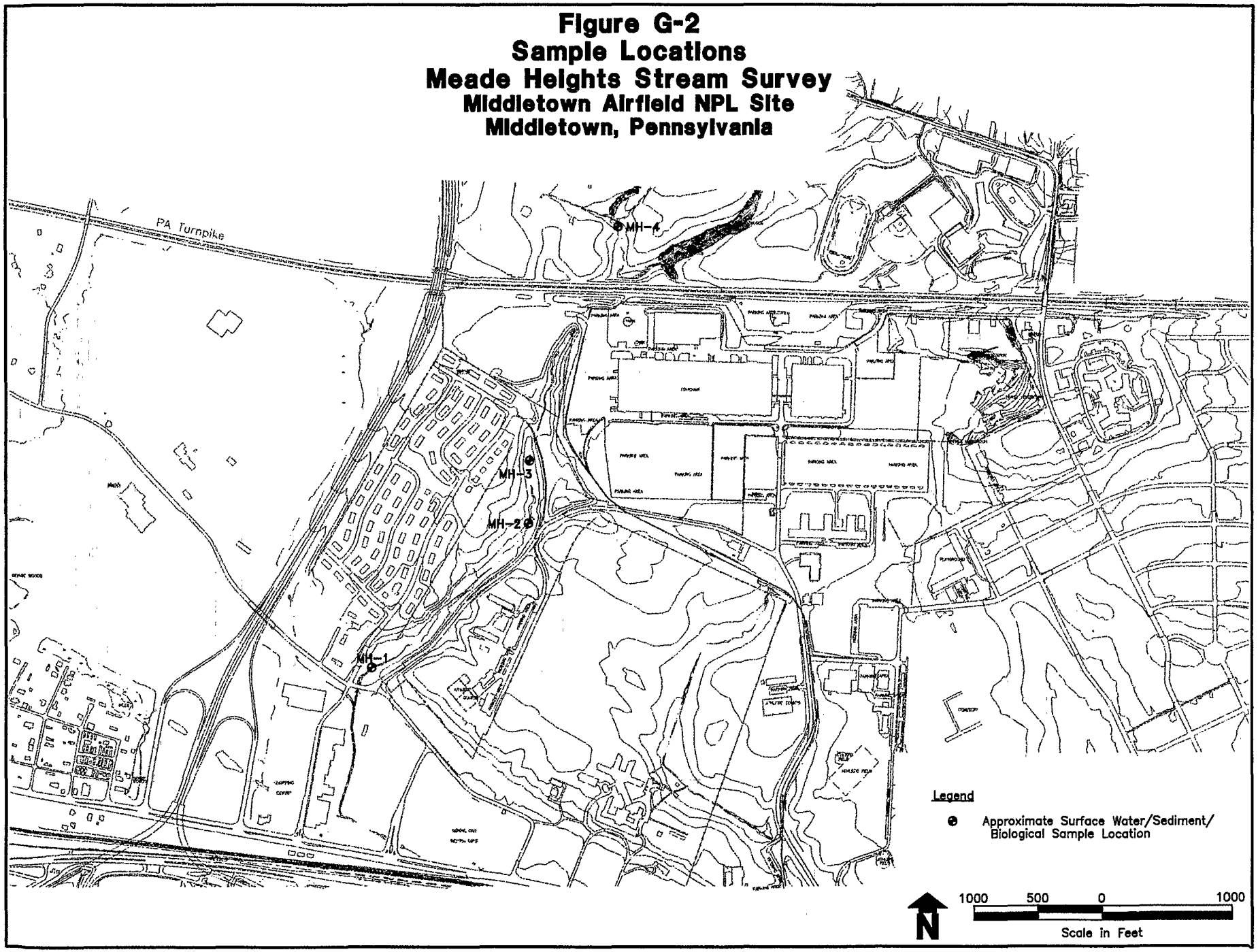
This investigation included the chemical analysis of surface water and surficial stream sediment, and a quantitative benthic macroinvertebrate and fish survey of the upper and middle portions of the tributary. The sampling methodology described below followed Section 3.5 of the Final, Supplemental Studies Investigation, Volume I - Work Plan Middletown Airfield NPL Site, Harrisburg, Pennsylvania (1 July 1994) under contract with the U.S. Army Corps of Engineers, Omaha District.

G.2.2 STATION LOCATIONS

ERM established a total of four sampling stations on Meade Heights Tributary, (see Figure G-2). The locations of these sampling stations are described below:

Station	Description
MH-1	Furtherest downstream station located 150 feet upstream of Rosedale Avenue, south of the Meade Heights housing complex . 5.62 inches North/8.15 inches West on USGS 7.5 Min. Series Topographic Map, Steelton-PA (Photorevised 1987).
MH-2	Approximately 1,700 feet upstream of Station 1. 14.60 inches North/0.10 inches West on USGS 7.5 Min. Series Topographic Map, Steelton-PA (Photorevised 1987).
MH-3	Approximately 500 feet upstream of Station 2 and 30 feet downstream of 12-ft. diameter steel pipe. 14.90 inches North/0.10 inches West on USGS 7.5 Min. Series Topographic Map, Steelton-PA (Photorevised 1987).

Figure G-2
Sample Locations
Meade Heights Stream Survey
Middletown Airfield NPL Site
Middletown, Pennsylvania



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MH-4 Most upstream station, approximately 450 feet upstream of the Pennsylvania Turnpike crossing.

15.65 inches North/17.20 inches West on USGS 7.5 Min. Series Topographic Map, Middletown-PA (Photorevised 1990)

G.2.3 *SURFACE WATER AND SEDIMENT SAMPLING*

Field measurements of physical features, and samples of surface water and surficial sediment, were collected from the four stations. Surface water samples were collected at stations MH-1, -2, -3, and -4. The location of each sampling station was marked with an oak stake. Sampling started from the furthest downstream location (MH-1) and proceeded upstream to minimize suspended sediments due to wading.

The stream surface water samples were collected near mid-channel by immersing the laboratory supplied bottles directly into the water and transferring the water to an appropriate sample container. A new sample bottle was used at each station to prevent cross-contamination. Care was taken not to over-fill the sample bottles that contained preservatives.

Stream sediments were collected from depositional areas at each station using clean stainless steel spoons. Fine grained sediments were targeted for sampling at each surface water location. All sediment samples were collected from the surficial bottom substrate to a depth of 4 inches. The volatile organic sample was placed directly into the appropriate sample container while the remaining sample was placed in a clean stainless steel bowl and homogenized. Sample containers were filled using a clean stainless steel spoon.

All water and sediment samples were analyzed for the complete Target Compound List/Target Analyte List (TCL/TAL) parameters which included TCL Volatile organic compounds (VOC), TCL Semivolatile organic compounds (SVOC), TCL pesticide/PCBs, TAL total metals and cyanide. Water samples were also analyzed for hardness, alkalinity and total dissolved solids, and sediment samples were also analyzed for TOC, grain size, percent moisture, and percent solids.

Field water quality parameters including water temperature, pH, dissolved oxygen, and specific conductivity were collected in-situ at each sampling station using electronic meters. Each meter was calibrated

according to their operations manual. A visual assessment of water color, odor, and turbidity was also made upon collection of all surface water samples.

A description of the texture, color, odor, and location of the sediment samples was recorded in the field notebook. Sediment pH and Eh were measured in the field at each station by mixing four parts distilled water to one part sediment.

Prior to sampling, a properly filled out identification label was affixed to each sample bottle. All collected samples were placed in insulated coolers where they were kept on ice at 4°C. Samples were transported by ERM staff directly to the laboratory for analyses following sampling.

G.2.4 *Benthic Macroinvertebrate Sampling Methods*

Benthic macroinvertebrates are defined (EPA, 1973) as animals large enough to be seen with the unaided eye, which can be retained by a U.S. Standard No. 30 sieve (595 microns openings), and that live at least part of their life cycles within or upon available substrates in a body of water or water transport system. The major groups of animals included in the freshwater benthic community are clams, snails, flatworms, segmented worms, leeches, crustaceans, and insects.

Sampling of benthic marcoinvertebrates was conducted utilizing kick nets in accordance with Rapid Bioassessment Protocols, Protocol III (RBP III) developed by the U.S. Environmental Protection Agency (USEPA). These protocols were published in USEPA's manual entitled *"Rapid Bioassessment Protocols For Use in Streams and Rivers - Benthic Macroinvertebrates and Fish"* (EPA, 1989). Benthic macroinvertebrates are used as indicators of water quality in RBP III because:

- benthic macroinvertebrates have limited migration patterns or are sessile; therefore, they are well suited for use as indicators of site-specific impacts;
- benthic macroinvertebrates integrate the effects of short-term environmental variations; most have a life span of over 1-year and sensitive life stages that respond quickly to stress;
- degraded conditions are usually easily identified by an experienced biologist;

- benthic macroinvertebrates are a primary food source for many species of fish; and
- benthic macroinvertebrates are abundant in most streams.

RBP III presents an approach for an integrated assessment of a benthic community by comparing a potentially impacted station to a reference station. Benthic macroinvertebrates are sampled in riffle or run areas of the stream since these areas have the greatest variety of micro habitats and usually support the most diverse and abundant benthic community. The assessment is conducted based on the calculation of the following metrics:

- Species richness,
- Modified Hilsenhoff Biotic Index,
- Ratio of Scraper and Filtering Collector functional feeding groups,
- Ratio of Ephemoptera, Plecoptera and Chironomidae (EPT) abundance,
- Percent contribution of dominant taxa,
- EPT Index,
- Community Similarity Index, and
- Ratio of Shredders to Total Organisms.

In addition to the kick net sampling, course particulate organic matter (CPOM) is also collected at each station. CPOM is plant litter, typically fallen leaves that accumulate in various depositional areas of the stream. The rationale for collecting CPOM samples is that many toxic compounds are adsorbed by the high organic matter in CPOM, and that the functional group of organisms termed "Shredders" that inhabit and ingest the CPOM are particularly sensitive to toxics. Therefore, CPOM samples are collected and processed separately. Organisms are identified as "Shredders" or "non-Shredders" for the purpose of evaluating whether toxic compounds are present.

Field notes such as stream depth, substrate type and size, presence of aquatic vegetation, and percent stream shading were recorded at each sample location to describe the general habitat.

Benthic macroinvertebrates were sampled at the four Meade Heights stations utilizing kick nets (mesh size: 200 microns) and CPOM sampling. Basically these methods include taking a minimum number of samples

during a standardized period at each stream station in a riffle/run habitat. Kick net sampling was conducted because of the low density of organisms in the stream. Kick nets were repeatedly conducted in an effort to collect a minimum of 100 organisms per station. At least 100 organisms are required for the RBP III biometrics assessments. A minimum of 10 kick nets per station were conducted.

Finally, CPOM samples were collected and sorted for the purpose of assessing the presence of Shredders. The CPOM samples were collected by hand-collecting leaf litter and other vegetative debris (twigs, bark, etc.) that had accumulated at each station. Each CPOM sample was placed in a separate sample bottle.

After collection, all organisms were sorted and preserved with 70 percent ethanol and were delivered to the taxonomic laboratory for identification and counting. Each sample bottle was labeled internally and externally. Following taxonomic identification and counting, a biometrics assessment in accordance with RBP III was conducted.

G.2.5 Fish Sampling Methods

Fish were sampled over 100 meters of stream utilizing a Coffelt Model BP-1 gasoline powered backpack electrofishing unit. This device placed a 50-60 Volt DC current of electricity into the water. Sampling was conducted by a team of two biologists working from downstream to upstream. Both biologists netted stunned fish as they proceeded upstream. Netted fish were placed in a water-filled bucket. When the end of the sampled section was reached, the biologists identified, weighed and measured each fish. Most of these fish were then returned to the stream unharmed. Specimens which could not be identified in the field were preserved in 70% ethanol and returned to the taxonomic laboratory for identification.

Fish data was intended to be assessed by utilizing the RBP Protocol VI (USEPA, 1989). However, due to the small number of fish and number of species present in the tributary, using this protocol was not possible. Rather, a qualitative discussion of the fish community is presented in Section G.3.4.

G.3 RESULTS

G.3.1 SURFACE WATER SAMPLES

G.3.1.1 Sampling Conditions

The weather was sunny, clear and approximately 72°F (22 °C) during the sampling period. Stream flow was very low; however, flowing water and pooled stream water were adequate at the four stations to allow the collection of water samples at all stations on 24 May 1994.

G.3.1.2 Field Measured Parameters

All surface water samples were clear, and no odors were detected at any stream station. Field measured parameters are shown in Table G-3. Water temperatures ranged from 14.5°C at Station 4 to 18.5 °C Station MH-2. Conductivity measurements ranged from 150 µmhos at Station MH-1 to 320 µmhos at Station MH-2.

Measurements of water pH were near neutral, with values ranging from 7.0 at Station MH-4 to 7.4 at Station MH-2. Dissolved oxygen ranged from 8.7 mg/l at Station MH-1 to 9.5 mg/l at Stations MH-3 and MH-4.

The average depth of water where the stream was flowing ranged from 1 to 6 inches deep in riffles and 6 inches in pools. Average width ranged from 5 to 10 feet. Stream flow was greatest at Station MH-1, where the flow volume was estimated at 1 to 2 feet per second (cfs). The headwaters at Station MH-4 had very low flow (estimated at less than 0.5 cfs).

Sediment field parameters are presented on Table G-3. Sediment pH were near neutral with pH ranging from 7.0 to 7.3. Eh ranged from +120 mV at Station MH-1 to +210 mV at Station MH-4. Eh values of this range indicate moderately reduced sediments. Sediments are described in Table G-4.

Table G-1 ***Meade Heights Surface Water and Sediment Field Parameters***
Meade Heights Stream Survey
Middletown Airfield Site
Harrisburg, Pennsylvania
May 1994

Station Number: Station Location: Sample Date:	Station MH-1 Downstream of Meade Heights 5/24/94	Station MH-2 Adjacent to Meade Heights 5/24/94	Station MH-3 Adjacent to Meade Heights 5/24/94	Station MH-4 Upstream of PA. Turnpike 5/24/94
Water Quality Parameters				
Temperature (°C)	16.0	18.5	17.0	14.5
Conductivity (µmhos)	290	320	305	150
Dissolved oxygen (ppm)	8.7	9.1	9.5	9.5
pH (Standard Units)	7.3	7.4	7.3	7.0
Water Color	Clear	Clear	Clear	Clear
Turbidity	None	None	None	None
Odor	None	None	None	None
Sediment Field Parameters				
pH (Standard Units)	7.3	7.2	7.0	7.3
Eh (mV)	+120	+190	+200	+210

Table G-2 Sample Locations and Sediment Sample Descriptions
Meade Heights Stream Survey
Middletown Airfield NPL Site
Harrisburg, Pennsylvania
May 1994

Station Number	Location and Sediment Description
MH-1	Surface water and sediment samples were collected at the wooden staked location which was 150 feet upstream of Rosedale Ave and approximately 75 feet upstream of a sewer crossing. Sediments were red-brown silty fine sand with limited vegetation. Sediments had no odor and no sheen when disturbed. Sediments were collected from the middle and eastern side of the creek just downstream of a riffle area. The creek at this station had steep eroded banks, was about 5 feet wide and the water depth was 2 to 4 inches. Grain size analysis: 1 % gravel, 92 % sand, 7 % silt/clay.
MH-2	The wooden stake was located about 1,700 feet upstream of Station MH-1. Surface water and sediment samples were collected about 5 feet from the staked location. A small tributary from the east enters Meade Heights Creek just upstream of the staked location. Sediments were red-brown silty fine sand with limited vegetation. Sediments had no odor and no sheen when disturbed. Sediments were collected from the delta area where the eastern tributary enters the main creek. The creek at this station had steep eroded banks, was about 5 feet wide and the water depth was 2 to 3 inches. Grain size analysis: 0 % gravel, 94 % sand, 6 % silt/clay.
MH-3	The wooden stake was located about 500 feet upstream of Station MH-2 and 30 feet downstream from where the creek exits a 12 foot corrugated pipe. The creek flows through this pipe for about 350 feet upstream of this station. Surface water and sediment samples were collected from the creek 30 feet downstream of the pipe. Sediments were brown clayey silt with some fine sand and limited vegetation. Sediments had no odor but had a slight sheen when disturbed. The creek bed at this station is about 20 feet wide; however the creek splits into two branches and flows around a sandy island which measured about 15 feet by 8 feet. Samples were collected from the western branch which was about 3 feet wide and the water depth was 2 to 6 inches. The creek at this station had steep eroded banks. Grain size analysis: 1 % gravel, 70 % sand, 29 % silt/clay.

Table G-2 ***Sample Locations and Sediment Sample Descriptions (Continued)***
Meade Heights Stream Survey
Middletown Airfield NPL Site
Harrisburg, Pennsylvania
May 1994

Station Number	Location and Sediment Description
MH-4	The wooden stake was located on the eastern branch of the main creek about 450 feet upstream (north) of the Pennsylvania Turnpike. Surface water and sediment samples were collected from the eastern branch approximately 75 feet downstream from a private road crossing. Sediments were red-brown silty fine sand with some medium sand and limited vegetation. Sediments had no odor and no sheen when disturbed. Sediments were collected from the northeastern side of the stream, just southwest of the staked location. The creek at this station had short steep eroded banks, was about 3 feet wide and the water depth was 1 to 2 inches. Grain size analysis: 1 % gravel, 86 % sand, 13 % silt/clay.

Table G-3
Surface Water Samples Summary Report
Meade Heights Stream Survey
Middletown Airfield NPL Site
Harrisburg, Pennsylvania
May 1994

		Sample ID	MH-SW-1	MH-SW-2	MH-SW-3	MH-SW-3A	MH-SW-4
		Sample Media	SWATER	SWATER	SWATER	SWATER	SWATER
		Date	5/24/94	5/24/94	5/24/94	5/24/94	5/24/94
Group	Parameter	Units					
TCL VOC	Acetone	ug/l		10 B	17 B	17 B	18 B
TAL METALS	Aluminum	ug/l					107
TAL METALS	Arsenic	ug/l	1.0	1.6	2.2		
TAL METALS	Barium	ug/l	110	123	133	134	114
TAL METALS	Calcium	ug/l	41200	42300	40200	40900	27000
TAL METALS	Copper	ug/l	27.6 B				
TAL METALS	Iron	ug/l	97.2 J	284 J	699 J	705 J	202 J
TAL METALS	Magnesium	ug/l	6550	6330	6160	6240	4350
TAL METALS	Manganese	ug/l	83.3	295	615	625	63.0
TAL METALS	Nickel	ug/l	9.2				
TAL METALS	Potassium	ug/l	2010	2010	2170	2230	2550
TAL METALS	Selenium	ug/l					0.76
TAL METALS	Sodium	ug/l	15800	21900	21700	22000	3540
TAL METALS	Zinc	ug/l	7.0 B		8.9 B	7.2 B	31.1 B
TDS	Total Dissolved Solids	mg/l	200	230	220	220	130
Hardness	Total Hardness	mg/l	141	152	147	149	105
Cyanides	Total Cyanide (water)	ug/l	4 J	4 J	4 J	4 J	4 J
Alkalinity	Alkalinity to pH 4.5	mg/l	71	82	81	80	50
TIC VOC	Total Unknown	ug/l		18 J	24 J	23 J	33 J

Table G-4
Sediment Samples Summary Report
Meade Heights Stream Survey
Middletown Airfield NPL Site
Harrisburg, Pennsylvania
May 1994

		Sample ID	MH-SED-1	MH-SED-2	MH-SED-3	MH-SED-3A	MH-SED-4
		Sample Media	SEDIMENT	SEDIMENT	SEDIMENT	SEDIMENT	SEDIMENT
		Date	5/24/94	5/24/94	5/24/94	5/24/94	5/24/94
Group	Parameter	Units					
TCL VOC	2-Butanone	ug/kg	2 J				
TCL VOC	Acetone	ug/kg	32 J	25 J	22 J	24 J	9 J
TCL VOC	Carbon Disulfide	ug/kg		2 J			
TCL VOC	Methylene Chloride	ug/kg	2 J	1 J			
TCL VOC	Trichloroethene	ug/kg			2 J	2 J	
TCL SVOC	Benzo(a)anthracene	ug/kg		88 J			61 J
TCL SVOC	Benzo(a)pyrene	ug/kg		83 J			
TCL SVOC	Benzo(b)fluoranthene	ug/kg	76 H	160 H	82 H	65 H	76 H
TCL SVOC	bis(2-Ethylhexyl)phthalate	ug/kg		83 J	76 J	69 J	
TCL SVOC	Butylbenzylphthalate	ug/kg			53 J		
TCL SVOC	Chrysene	ug/kg		97 J			62 J
TCL SVOC	Fluoranthene	ug/kg	97 J	240 J	110 J	88 J	94 J
TCL SVOC	Phenanthrene	ug/kg		140 J	60 J		
TCL SVOC	Pyrene	ug/kg	79 J	210 J	84 J	69 J	110 J
TCL PESTICIDES	DDD	ug/kg					6 J
TAL METALS	Aluminum	mg/kg	2630	1550	3810	3470	2240
TAL METALS	Arsenic	mg/kg	2.3 J	2.7 J	4.1 J	3.8 J	2.4 J
TAL METALS	Barium	mg/kg	42.4	35.4	90.3	80.0	61.7
TAL METALS	Beryllium	mg/kg	0.30 J	0.27 J	0.42 J	0.38 J	0.29 J
TAL METALS	Cadmium	mg/kg	0.41	0.26	0.38		0.46
TAL METALS	Calcium	mg/kg	3250 J	2020	1490	1150	1520
TAL METALS	Chromium	mg/kg	6.1	4.4	7.1	7.4	6.5
TAL METALS	Cobalt	mg/kg	2.9	2.2	5.0	4.2	3.5
TAL METALS	Copper	mg/kg	4.2 B	2.9 B	4.4 B	4.3 B	4.1
TAL METALS	Iron	mg/kg	3970	5010	6960	11400	5700
TAL METALS	Lead	mg/kg	8.4 J	8.0 J	10.2 J	9.0 J	7.9 J
TAL METALS	Magnesium	mg/kg	894 J	884	794	636	681
TAL METALS	Manganese	mg/kg	380	343	573	417	291
TAL METALS	Mercury	mg/kg			0.023 J	0.028 J	0.018 J
TAL METALS	Nickel	mg/kg	3.9	2.5	4.6	4.3	4.0
TAL METALS	Potassium	mg/kg	364	276	382	361	390
TAL METALS	Sodium	mg/kg	40.5 B	28.0 B	46.0 B	62.6 B	27.7 B
TAL METALS	Vanadium	mg/kg	9.5	6.9	10.6	9.4	9.5
TAL METALS	Zinc	mg/kg	35.7	29.9	36.2	30.0	21.8
TOC	Total Organic Carbon	mg/kg	1100	1700 J	4200	3200	1200
pH	pH		7.41	7.87	7.57	7.48	7.83
Moisture	Moisture	% by wt.	24.0	22.6	35.0	32.7	29.2
TIC VOC	Total Unknown Alcohols	ug/kg	8 J	15 J			14 J
TIC VOC	Total Unknown Alkanes	ug/kg	470 J	15 J			
TIC SVOC	Total Unknown	ug/kg	240 J	510 J	1690 J	210 J	
TIC SVOC	Total Unknown Alkanes	ug/kg		640 J	1430 J	1130 J	940 J

G.3.1.3 Water Chemistry

Surface water laboratory analytical results are presented in Table G-3. The following provides a summary of the analytical results for surface water samples.

A total of 14 metals were detected in surface water samples. Four of the 14 metals detected in surface water samples were abundant, naturally occurring elements found in regional soils. These metals, including calcium, magnesium, potassium and sodium, were found at all sampling locations. Other metals detected were aluminum, arsenic, barium, iron, manganese, nickel, and selenium. Aluminum, selenium and nickel were detected in low concentrations only at one station each. Copper and zinc were detected in the blank. Total metal concentration ranges included:

- aluminum, 107 µg/l (Station MH-4 only);
- arsenic, 1.0 µg/l (Station MH-1) to 2.2 µg/l (Station MH-3);
- barium, 110 µg/l (Station MH-1) to 134 µg/l (Station MH-3A, duplicate of Station 3);
- calcium, 27,000 µg/l (Station MH-4) to 42,300 µg/l (Station MH-2);
- iron, 97.2 µg/l (Station MH-1) to 705 µg/l (Station MH-3A);
- magnesium, 4,350 µg/l (Station MH-4) to 6,500 µg/l (Station MH-1);
- manganese, 33 µg/l (Station MH-4) to 625 µg/l (Station MH-3A);
- nickel, 9.2 µg/l (Station MH-1 only);
- potassium, 2,100 µg/l (Stations MH-1 and MH-2) to 2,550 µg/l (Station MH-4);
- selenium, 0.76 µg/l (Station MH-4 only); and,
- sodium, 3,540 µg/l (Station MH-4) to 22,000 µg/l (Station MH-3A).

Total dissolved solids (TDS) ranged from 130 mg/l at Station MH-4 to 230 mg/l at Station MH-2. Alkalinity values ranged in concentration from 27 mg/l at Station MH-5 to 49 mg/l at Station MH-3. The range of hardness was from 105 mg/l at Station MH-4 located in the headwaters to 152 mg/l at Station MH-2. Total cyanide was detected at each station at 4 µg/l, but was "J" qualified indicating that the concentrations reported are "estimated" by the laboratory. Acetone was also detected at most stations but was qualified as a "B" value indicating that acetone was also reported in the associated blank sample.

G.3.1.4 *Sediment Chemistry*

Laboratory analytical results for surficial sediment samples are presented in Table G-4. A total of five VOCs, nine SVOCs, one pesticide, 19 metals and three miscellaneous parameters were detected. The majority of the organic compounds detected were "J" qualified by the laboratory. And most were detected at only one or two stations. DDD, the only pesticide detected, was found at 6 µg/l "J" at Station MH-4. The majority of the detected organic compounds were present at very low concentrations are likely to be the result of low level nonpoint source pollution.

A total of 19 metals were detected, many of which may be due to naturally occurring elements found in the regional geology and soils. These metals were found at all sampling locations. Total metal concentration ranges included:

- aluminum, 1550 mg/kg (Station MH-2) to 3810 mg/kg (Station MH-3);
- arsenic, 2.3 mg/kg "J" (Station MH-1) to 4.1 mg/kg "J" (Station MH-3);
- barium, 35.4 mg/kg (Station MH-2) to 90.3 mg/kg (Station MH-3);
- beryllium, 0.27 mg/kg "J" (Station MH-2) to 0.42 mg/kg "J" (Station MH-3);
- cadmium, 0.26 mg/kg (Station MH-2) to 0.46 mg/kg (Station MH-4);
- calcium, 1,150 mg/kg (Station MH-3A) to 3,250 mg/kg "J" (Station MH-1);
- chromium, 4.4 mg/kg (Station MH-2) to 7.4 mg/kg (Station MH-3A);
- cobalt, 2.2 mg/kg (Station MH-2) to 5.0 mg/kg (Station MH-3);
- copper, 2.9 mg/kg "B" (Station MH-2) to 4.4 mg/kg "B" (Station MH-3);
- iron, 3,970 mg/kg (Station MH-1) to 11,400 mg/kg (Station MH-3A);
- lead, 7.9 mg/kg "J" (Station MH-4) to 10.2 mg/kg "J" (Station MH-3);
- magnesium, 636 mg/kg (Station MH-4) to 894 mg/kg "J" (Station MH-1);
- manganese, 291 mg/kg (Station MH-4) to 573 mg/kg (Station MH-3);

- mercury, 0.018 mg/kg "J" (Station MH-4) to 0.028 mg/kg "J" (Station MH-3A);
- nickel, 2.5 mg/kg (Station MH-2) to 4.6 mg/kg (Station MH-3);
- potassium, 276 mg/kg (Station MH-2) to 390 mg/kg (Station MH-4);
- sodium, 27.7 mg/kg (Station MH-4) to 62.6 mg/kg (Station MH-3A);
- vanadium, 6.9 mg/kg (Station MH-2) to 10.6 mg/kg (Station MH-3); and,
- zinc, 21.8 mg/kg (Station MH-4) to 36.2 mg/kg (Station MH-3).

Total organic carbon (TOC) ranged from 1,100 mg/kg at Station MH-1 to 4,200 mg/kg at Station MH-3. Moisture values ranged from 22.6% at Station MH-2 to 35% at Station MH-3. Grain size analyses indicated that the sediment samples were mainly composed of sand particles (see Table G-2).

G.3.2 *HABITAT ASSESSMENT*

An important factor to consider when evaluating benthic macroinvertebrate communities is the quality of available habitat at each station. Habitat differences between stations influence the types and numbers of macroinvertebrates inhabiting a particular area.

Physical characteristics of the stream stations including the surrounding land use, amount of shading, general stream substrate, and type of vegetation present along the stream bank were similar at each station. Stream substrate descriptions are provided in Table G-2.

Attachment G.1 contains Photographs 1 through 10 of the sampling stations. Photographs 1 and 2 show Station MH-1. The relatively steep cut banks and wide, shallow channels were observed which indicated that excessive storm flows occur due to the developed and paved areas of the watershed. These storm induced high flows have created a uniform habitat that lacks deep pools and riffle areas. In addition, the lack of habitat diversity in the channel accelerates water velocities which most likely induces substrate scour. Scour dislodges organisms and creates a shifting unstable substrate that is limiting to aquatic organisms.

Photographs 3, 4 and 5 show Station MH-2, and provide a good observation of the low flows of the tributary during the survey period. A

typical riffle area is shown in Photograph 4. Photograph 6 shows the discharge of the stream from the large steel pipe (Photograph 7) placed in the stream channel for an unknown reason. This pipe was very rusty and in places has rusted through. Photograph 8 shows the downstream end of the pipe underlying the Turnpike. Photographs 9 and 10 shows the location of Station MH-4 upstream of the Turnpike.

As can be observed from the photographs, the tributary has been modified during its history by human activity, such as piping and channelization. Human activities in the watershed such as highways, commercial activities and storm water drainage appeared to be exerting habitat changes that resulted in stress to the aquatic community. Particularly absence from the stream was a variety of habitats such as rocky riffle areas and deep pools. It is varied habitats that allow a diverse aquatic community to exist.

G.3.3 BENTHIC MACROINVERTEBRATE SURVEY

Table G-5 presents the results of the benthic macroinvertebrate samples collected at each of the stream stations. A total of 565 organisms representing 23 different taxa were collected from the combined four sampling stations. Overall, species composition at the four stations were similar. Organisms sensitive to deteriorating water quality such as stoneflies and caddisflies were found at all stations, although their abundance generally decreased upstream to downstream.

The sensitive stonefly *Zealeutra,* a "Shredder" was collected at all stations. The net spinning caddisfly, *Potamyia,* found at each station are in the functional feeding group defined as "Filtering Collectors", a group also generally considered one of the most sensitive group to toxics. Water bugs, such as water striders (*Gerris*) and water boatman (*Hespererocorixa*) were more abundant at all stations but are not indicated by the sample results. These species are fast swimmers and were able to avoid collection with a kick net.

The results of the kick net sampling are presented in Table G-5. Rapid Bioassessment Protocol III (USEPA, 1989) metrics are presented on page 2 of Table G-5. These metrics were calculated based on the abundance and diversity of organisms as displayed on page 1 of the table. Station MH-4 was deemed the reference station because it is upstream of all site influences.

Table G-5
Results of the Benthic Macroinvertebrate KICKNET Sampling
Meade Heights Stream Survey
Middletown Airfield NPL Site
Harisburg, Pennsylvania
May 1994

	Functional Feeding Group	Sta. MH-1	Sta. MH-2	Sta. MH-3	Sta. MH-4
NEMATOMORPHA (Horsehair worms)					
Unidentified sp.		2			
ANNELIDA (Aquatic Earthworms)					
Oligochaeta (Unidentified sp.)	CG	2	4	2	
GASTROPODA (Snails)					
Physidae					
Physa	CG		1		6
PELECYPODA (Clams)					
Sphaeriidae					
Sphaerium	FC			5	
ISOPODA (Sowbugs)					
Asellidae					
Asellus	SH				3
DECAPODA (Crayfishes, Shrimps)					
Cambaridae					
Cambarus	CG				2
INSECTA					
Ephemeroptera (Mayflies)					
Oligoneuriidae					
Isonychia	FC			2	4
Baetidae					
Baetis	CG			4	12
Plecoptera (Stoneflies)					
Leuctridae					
Zealeutra	SH	12	8	3	41
Megaloptera (Alderflies, Dobsonflies)					
Corydalidae					
Corydalus	P				3
Trichoptera (Caddisflies)					
Hydropsychidae					
Potamyia	FC	3	4	3	18
Cheumatopsyche	FC			5	21
Coleoptera (Aquatic Beetles)					
Elmidae					
Stenelmis	SC		2		2
Diptera (Flies, Midges)					
Chironomidae					
Chironomini					
Chironomus	SH	20	5	17	3

Table G-5
Results of the Benthic Macroinvertebrate KICKNET Sampling
Meade Heights Stream Survey
Middletown Airfield NPL Site
Harisburg, Pennsylvania
May 1994

Dicrotendipes	CG	36	2	5	7
Tanytarsini					
Tanytarsus	FC	60	11		52
Cladotanytarsus	FC	8			3
Orthocladiini					
Bryophaenocladius	CG	2		2	8
Eukiefferiella	CG	6		6	12
Ortocladius	CG	12	5	14	21
Tipulidae					
Tipula	SH	4			
Antocha	CG	2			
Simuliidae					
Simulium	FC	23	27	10	8

Results of the Benthic Macroinvertebrate KICKNET Sampling

		MH-1	MH-2	MH-3	MH-4
Number of Taxa		**14**	**10**	**13**	**18**
Total # of Organisms		**192**	**69**	**78**	**226**
Shannon Diversity (Base 2)		**3.00**	**2.7**	**3.3**	**3.5**
Modified Biotic Index		**6.3**	**5.9**	**6.1**	**4.7**
Ratio-Scrapers/ Filter. Collectors		**0.00**	**0.05**	**0.00**	**0.02**
Ratio EPT & Chiron. Abund.		**0.10**	**0.52**	**0.39**	**0.91**
% Dominant Taxa		**37%**	**39%**	**22%**	**23%**
EPT Index		**15**	**12**	**17**	**96**
Community Similarity Index		**0.46**	**0.47**	**0.55**	**1.00**
Community Loss Index		**0.57**	**0.90**	**0.54**	**0.00**
Ratio Shredders to Total		**0.52**	**0.46**	**0.58**	**0.48**

FUNCTIONAL FEEDING GROUP

SH = Shredder
CG = Collector/Gatherer
FC = Filtering Collector
P = Predator
SC = Scraper
PI = Piercer

Station MH-4 had slightly greater abundance of organisms (n=226) and number of taxa (richness) than the downstream stations. Both abundance and richness were reduced at the downstream stations. The greater abundance may have been due to the more constant spring-like water source present at Station MH-4. The lower stations also had more sandy and silty substrates which provided less suitable habitat for colonization.

The Shannon index is a measure of diversity based on a random sample of species abundances from an entire community. According to an evaluation conducted by Wilhm (1970) of diversity values calculated from numerous surveys from polluted and unpolluted waters, it was concluded that Shannon diversity indices were generally between 3 and 4 in unpolluted waters and less than 1 in polluted waters. Shannon diversity indices were relatively high at each station ranging from 3.5 at Station MH-4 to 2.7 at Station MH-2. Diversity has been linked to community health and the greater the diversity of organisms within a community, the healthier the community (i.e., unimpacted) is considered. A community will have a high species diversity if many equally abundant species are present. Conversely, a community with only a few different species present or with overly dominant species, would have a low diversity.

Results of the CPOM sample analyses for each station are presented in Table G-6. The purpose of the CPOM sample is to determine if the functional feeding group labeled as "Shredders" are present. As a group, "Shredders" are comprised of numerous taxa, but are most commonly species of aquatic insects that feed on leaf matter. "Shredders" can be thought of as representing the worst case for exposure because they are sensitive to toxic contaminants and their food matter tends to adsorb greater amounts of contaminants. As shown in Table G-6 "Shredders," were found at every station.

The Modified Biotic Index, based on calculation methods described by Hilsenhoff (1987), was calculated and is shown on Table G-7. This index factors in species tolerance toward organic pollution and the number of species collected in a given sample. The higher the tolerance value the more tolerant the organisms within the genus are to organic pollution. Biotic indices ranged from 4.7 at Station MH-4 to 6.3 at Station MH-1.

The biotic index ranges from 0 to 10 and is evaluated according to the following table from Hilsenhoff (1987).

Table G-6
Results of the Benthic Macroinvertebrate CPOM Sample
Meade Heights Stream Survey
Middletown Airfield NPL Site
Harrisburg, Pennsylvania
May 1994

		Sta. MH-1	Sta. MH-2	Sta. MH-3	Sta. MH-4
Number of Shredders		24	11	15	21
Number of Non-shredders		22	13	11	23
Ratio of Shredders to Total		0.52	0.46	0.58	0.48

Table G-7
Calculation of the Generic Level Biotic Index
Meade Heights Stream Survey
Middletown Airfield NPL Site
Harrisburg. Pennsylvania
May 1994

	Tolerance Values (Genus)*	Reference for Tolerance Values	Modified Biotic Index MH-1 Sta. 1	MH-2 Sta. 2	MH-3 Sta. 3	MH-4 Sta. 4
NEMATOMORPHA (Horsehair worms)						
Unidentified sp.	10	Class	20			
ANNELIDA (Aquatic Earthworms)						
Oligochaeta (Unidentified sp.)	10	Class	20	40	20	
GASTROPODA (Snails)						
Physidae						
Physa	9	Class		9		54
PELECYPODA (Clams)						
Sphaeriidae						
Sphaerium	5	Genus			25	
ISOPODA (Sowbugs)						
Asellidae						
Asellus	8	Genus				24
DECAPODA (Crayfishes, Shrimps)						
Cambaridae						
Cambarus	6	Genus				12
INSECTA						
Ephemeroptera (Mayflies)						
Oligoneuriidae						
Isonychia	3	Genus			6	12
Baetidae						
Baetis	4	Genus			16	48
Plecoptera (Stoneflies)						
Leuctridae						
Zealeuctra	0	Genus	0	0	0	0
Megaloptera (Alderflies, Dobsonflies)						
Corydalidae						
Corydalus	3	Genus				9
Trichoptera (Caddisflies)						
Hydropsychidae						
Potamyia	4	Genus	12	16	12	72
Cheumatopsyche	6	Genus			30	126
Coleoptera (Aquatic Beetles)						
Elmidae						
Stenelmis	7	Genus		14		14
Diptera (Flies, Midges)						
Chironomidae						
Chironomini						
Chironomus	11	Genus	220	55	187	33
Dicrotendipes	6	Genus	216	12	30	42
Tanytarsini						
Tanytarsus	7	Genus	420	77		364
Cladotanytarsus	7	Genus	56			21
Orthocladiini						
Bryophaenocladius	6	Class	12		12	48
Eukiefferiella	4	Genus	24		24	48
Ortocladius	4	Genus	48	20	56	84
Tipulidae						
Tipula	4	Genus	16			
Antocha	5	Genus	10			
Simuliidae						
Simulium	6	Genus	138	162	60	48
Total Tolerance Values			1212	405	478	1059
Total Organisms in Sample			192	69	78	226
Generic Level Biotic Index			6.3	5.9	6.1	4.7

*U.S.E.P.A. 1990. Freshwater macroinvertebrate species list including tolerance values and functional feeding group designations for use in rapid bioassessment protocols. Report 11075.05. Assessment and Watershed Protection Division, Wash., D.C.

Biotic Index

Biotic Index	Water Quality	Degree of Organic Pollution
0.00 - 3.50	Excellent	No apparent organic pollution
3.51 - 4.50	Very good	Possible slight organic pollution
4.51 - 5.50	Good	Some organic pollution
5.51 - 6.50	Fair	Fairly significant organic pollution
6.51 - 7.50	Fairly poor	Significant organic pollution
7.51 - 8.50	Poor	Very significant organic pollution
8.51 - 10.00	Very poor	Severe organic pollution

According to the biotic indices above, all of the stations indicated fair to good water quality.

The Jaccard community similarity index was calculated to evaluate the species composition and community similarity between each station. The similarity index compared the composition of species from the reference Station MH-4 to the composition of species from another station. This number ranges from 0 (for completely dissimilar communities) to 1.0 (for identical communities). Similarity indices were generally 0.50 for Stations MH-1, MH-2 and MH-3 when compared to the reference Station MH-4.

Other metrics calculated included ratio of "Scrapers" to "Filtering Collectors", Ratio of the EPT and Chironomid Abundance, Percent Dominant Taxa, EPT Index Community Loss Index and Ratio of "Shredders" to the Total Organisms. These metrics were used to conduct the Rapid Bioassessment III Protocol. Explanations of each of these metrics are given in USEPA (1989). Each of these metrics are compared to the reference Station MH-4. A summary of this comparison is provided below.

Metric	Comparison to Reference Station MH-4			
	Sta. MH-1	Sta. MH-2	Sta. MH-3	Sta. MH-4
1. Taxa Richness	78%	56%	72%	100%
2. Modified Biotic Index	75%	80%	77%	100%
3. Ratio Scrap:Filt. Coll.	0%	250%	0%	100%
4. Ratio of EPT & Chiro.	11%	57%	43%	100%
5. % Dominant Taxa	37%	39%	22%	23%
6. EPT Index	16%	13%	18%	100%
7. Community Loss Index	0.57	0.90	0.54	0
8. Ratio Shredders:Total	108%	96%	121%	100%

These metric calculations were then scored according to a rating table in USEPA (1989) and compared to the reference station MH-4.

Metric	Bioassessment Score			
	Sta. MH-1	Sta. MH-2	Sta. MH-3	Sta. MH-4
1. Taxa Richness	4	2	4	6
2. Modified Biotic Index	4	4	4	6
3. Ratio Scrap:Filt. Coll.	0	6	0	6
4. Ratio of EPT & Chiro.	0	4	2	6
5. % Dominant Taxa	2	2	4	4
6. EPT Index	0	0	0	6
7. Community Loss Index	4	4	4	6
8. Ratio Shredders:Total	6	6	6	6
Total Score	20	28	24	46
Percent. Comp. Reference	43%	61%	52%	100%
Biological Condition	Mod. Impaired	Slight Impaired	Slight Impaired	-----

The RBP III assessment indicated that the lower three stations are moderately to slightly impaired when compared to the upper most reference station MH-4. The cause of this impairment may be the result of physical factors, such as substrate condition, intermittent flows, or high velocity scouring storm flows, or chemical factors such as the introduction of contaminants. Section G.4 of this report will further discuss the reasons for this impairment.

G.3.4 *FISH SURVEY*

Table G-8 presents the results of the electro-fishing survey of the tributary. A very limited fish community was present that consisted only of two minnow species, the blacknose dace *(Rhinichthys atratuluss)* and the creek chub *(Semotilus atromaculatus)*. Of the two species, the blacknose dace was more abundant. Both of these species are considered tolerant and generalist in their feeding habitats. Total numbers and total biomass of fish were similar at Stations MH-1, MH-2 and MH-3. No fish were observed or captures at Station MH-4. A primary reason for the lack of fish was judged to be the shallow water depth and generally poor habitat to support larger species.

Table G-8 *Results of Electro-Fishing Survey*
Meade Heights Stream Survey
Middletown Airfield NPL Site
Harrisburg, Pennsylvania
May 1994

Length (mm) from: / Species to:	21 / 30	31 / 40	41 / 50	51 / 60	61 / 70	71 / 80	81 / 90	91 / 100	101 / 110	111 / 120	121 / 130	131 / 140	141 / 150	Total Number	Total Biomass	Percent Abundance
Station MH-1																
Blacknose dace	4 (*)	25 (12)	19 (19)	17 (28)	1 (3)									66	62	69%
Creek chub		4 (2)	7 (8)	1 (1)	3 (6)	4 (19)	2 (14)	3 (30)	1 (14)	2 (36)	3 (74)			30	204	31%
													Totals	**96**	**266g**	
Station MH-2																
Blacknose dace	1 (*)	5 (2)	20 (20)	12 (22)	3 (7)									41	51	64%
Creek chub			1 (1)	1 (2)	2 (4)	1 (4)	3 (22)	6 (54)	4 (51)	1 (19)	1 (20)	2 (59)	1 (39)	23	275	36%
													Totals	**64**	**326g**	
Station MH-3																
Blacknose dace		5 (3)	35 (34)	17 (34)										57	71	62%
Creek chub			2 (2)	2 (4)	10 (30)	1 (4)	6 (32)	7 (65)	1 (12)	3 (56)	1 (23)		2 (71)	35	299	38%
													Totals	**92**	**370g**	
Station MH-4																
No fish observed																

Note: The numbers outside the parentheses denote number of species and the numbers inside the parentheses indicate biomass in grams.
Stations are listed in order from downstream to upstream

* Total biomass was less than 1 gram

G.4 DISCUSSION

An objective of this stream survey was to determine if water and/or sediment chemical quality was significantly impacting the aquatic ecosystem. Observations made during the May 1994 survey indicated that stream flows were very low and the base flow was likely due to ground water inflow. The very low stream flow in the Meade Heights Tributary during the survey, created worst-case conditions in terms of stress to aquatic life.

Water and surficial sediment samples collected at the four stations and submitted to the laboratory for chemical analyses did not generally indicate concentrations of parameters stressful to aquatic life. Although there was a general trend of increasing concentrations of most parameters in a downstream direction, the relative increase from the reference station to the downstream station did not appear to be significant.

Habitat quality was found to be a limiting feature to the aquatic community at all the stream stations. The majority of habitat disturbance appeared to be historic. Current land use appeared to be relatively stable. The sandy substrate and lack of a varied physical habitat posed severe limitations on aquatic life with specific habitat requirements. The lack of riffle areas and deep pools greatly reduced the potential for colonization by a diverse group of macroinvertebrates and fish. Run-off of stormwater from highways and commercial, paved properties in the upper reaches of the tributary resulted in siltation from bank erosion and scour of the unstable sandy substrate.

Considering the relatively poor habitat conditions, the aquatic macroinvertebrate community found at the four stream stations was relatively diverse, but the abundance of organisms was relatively low. The macroinvertebrate community is a good indicator of water quality because it is not mobile and generally has life cycles of sufficient length to respond to stream conditions. The low abundance was caused by limiting habitat features, which provided little suitable substrate for colonization. The RBP III assessment indicated a slight to moderate biological impairment at the three downstream stations. This impairment is likely caused by habitat-induced stresses. The fish community consisted of two minnow species which is also indicative of habitat limitations.

Based on this bioassessment the following conclusions were reached:

- stream flow was low, thus "worst case" conditions were measured;
- habitat features of the stream were very limiting to aquatic life;
- chemical samples of water and surficial sediments indicated little potential for impact;
- the benthic macroinvertebrate community was limited in diversity and abundance at all stations, but relatively pollution-sensitive species were present;
- the benthic macroinvertebrate community was limited because of the intermittent nature of flow and the poor habitat conditions which are inherently stressful to benthic macroinvertebrates; and
- fish life was limited to two species of minnows, both common to small streams.

G.5 REFERENCES

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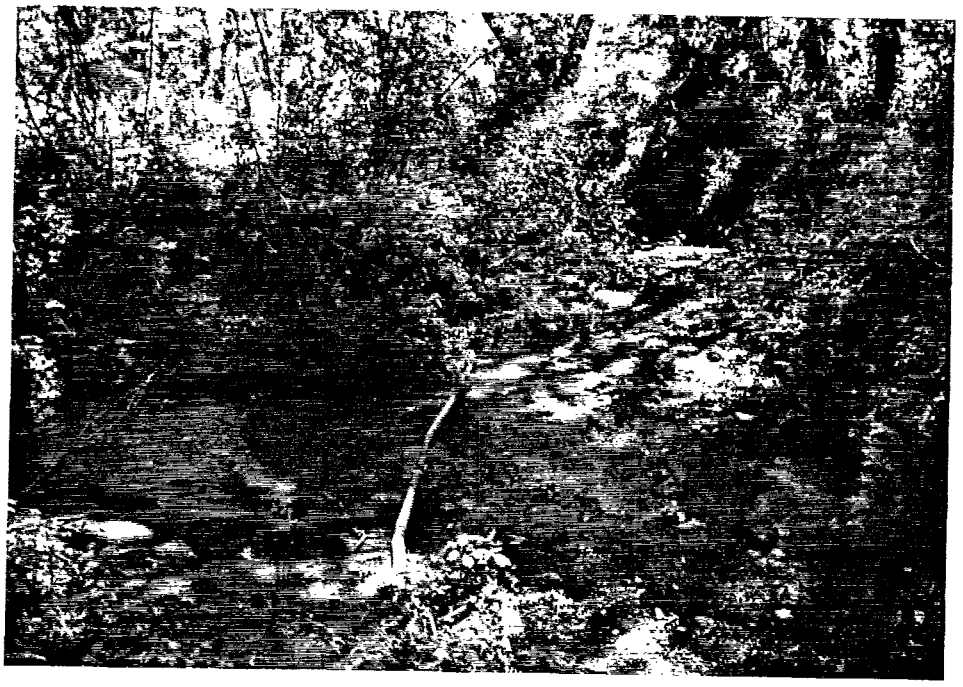
Attachment G.1
Station Photographs

Photograph #1:
Meade Heights tributary
at Station MH-1

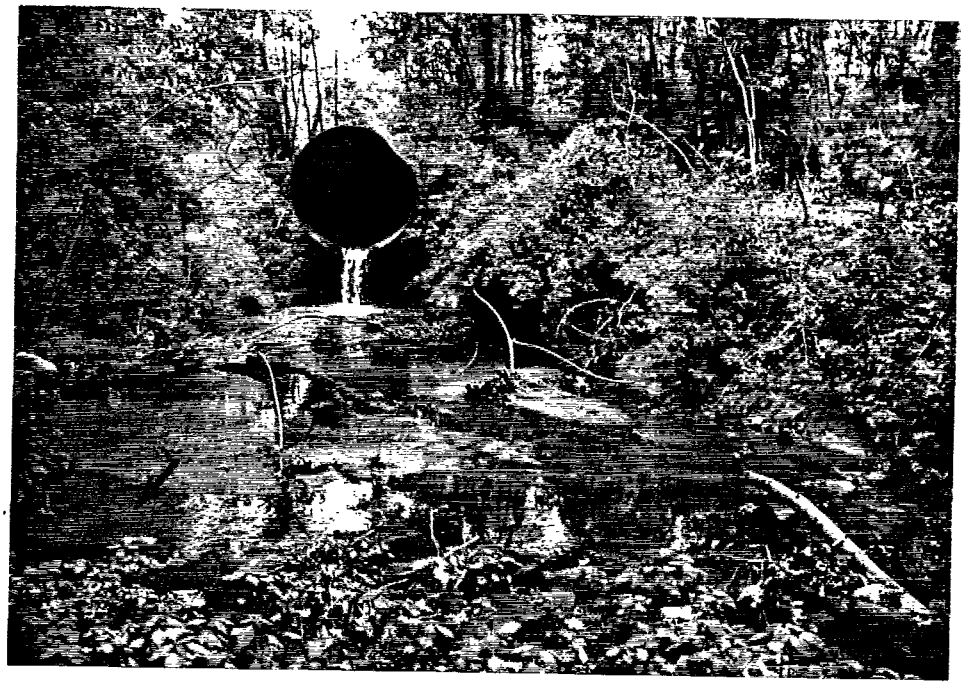
Photograph #2:
Meade Heights tributary
looking downstream at
Station MH-1

Photograph #3:
Meade heights tributary
at Station MH-2 looking upstream
(North)

Photograph #4:
Meade Heights tributary
looking downstream at Station MH-2



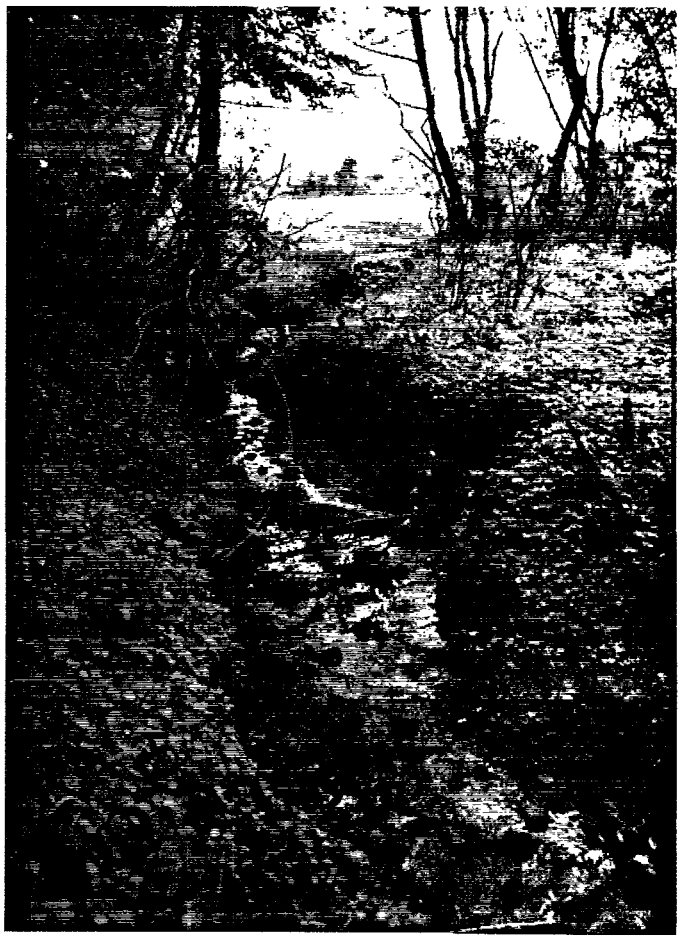
Photograph #5: Typical section of Meade Heights tributary between Stations MH-2 and MH-3



Photograph #6: Meade Heights tributary at Station MH-3 showing large steel pipe and location of sediment sample, at arrow

Photograph #7: Meade Heights tributary section contained in large steel pipe upstream of Station MH-3

Photograph #8: Meade Heights Tributary downstream of PA Turnpike and Station MH-4, showing culvert pipe that conveys tributary under the PA Turnpike



Photograph #9:
Meade Heights tributary
at Station MH-4

Photograph #10:
Meade Heights tributary
looking upstream from
Station MH-4

Appendix H
Monitoring Well Development Forms

Figure 4-4
Well Development Form
Middletown Airfield Site

Project: USACE Site Name: HIA Location: ERM-1S

Date: 6-30-94 Form Completed by: Warren Fop Job Title: Project Geologist

Total Depth of Well: 13.28 Elevation of Base of Well: Not Surveyed

Initial Water Level (Static) 6.85 Date Measured: 6-30-94 Time: 1015

Water Level Immediately Following Development Date Measured: Time:

Water Level Afer Development (Static) Date Measured: Time

Method of Development:

	Type	Size	Make
Bailer			
Pump	~~Jet Sub.~~ (WF) PVC	1 1/2"	~~Hydrogroup~~ (WF) Grundfos

Total Development Time: 4hours Total Volume of Water Removed: Average Pumping Rate: < 1g/min.

	Before Pumping				During Pumping				After Pumping			
Date and Time 6-30-94	1015	1050	1120	1150	1220	1250	1320	1350	1420			
Volume of Water Removed	0											
Description of Water (Clarity, Particulates, Odor)	Dark Brown	"	"	"	"	"	"	"	"			
pH	6.2	5.9	5.6	5.8	5.7	5.8	5.7	5.6	5.7			
Conductivity umhos	600	600	600	590	600	590	610	600	590			
Turbidity NTU (-4)	~~1200~~	-.43	4.7	3.15	9.3	3.9	4.1	4.0	4.2			
Temperature °C	18°	17	17	17	17	17	17	17	17			
Characteristics of Sediment, Color, Odor, etc.	—	—	—	—	—	—	—	—	—			

Volume of Sediment from Last One Liter of Development Water:

Description of Containers and Containing Area for Water Removed During Pumping: NA Container Size: NA # of Containers: NA

Volume of Any Added Water: NA Source of Any Added Water: NA For Added Water: Temp, pH, Conductivity, Turbidity: NA

Note: Drew down to 2.5' from Total Depth.

Figure 4-4
Well Development Form
Middletown Airfield Site

Project: USACE Site Name: HIA Location: ERM-II

Date: 3/20/95 Form Completed by: Scott Lane Job Title: Env. Field. Tech.

Total Depth of Well: 98.07' Elevation of Base of Well: Not Surveyed

Initial Water Level (Static) 5.78' Date Measured: 3/20/95 Time: 09:35
Water Level Immediately Following Development 5.96' Date Measured: 3/20/95 Time: 12:57
Water Level Afer Development (Static) 10.61' Date Measured: 3/20/95 Time: 14:45

Method of Development:	Type	Size	Make
Bailer	SS	10'x 2⅜"	Hydrogroup
Pump	Jet Sub.		Grundfos

Total Development Time: Surged/bailed 2hrs. pumped for 45 min. Total Volume of Water Removed: 35 gal. bailed (approx.) 260 gal. pumped Average Pumping Rate: 6 gal./min.

	Before Pumping				During Pumping				After Pumping			
Date and Time 3/20/95	13:47	1354	1400	1405	1409	1412	1415	1417	1420	14:23	14:26	1429
Volume of Water Removed	1st. gal	35 gal.	68 gal	98 gal	122 gal	140 gal.	158 gal.	170 gal	188 gal.	206 gal.	224 gal.	
Description of Water (Clarity, Particulates, Odor)	slightly cloudy	clear	→								→	clear
pH	7.4	7.0	7.1	7.0	6.8	6.9	6.8	6.8	6.9	6.9	6.9	6.9
Conductivity	600	700	600	600	600	600	700	600	600	600	600	600
Turbidity	36.4	6.42	4.01	3.46	2.97	1.91	2.20	1.73	1.81	2.23	1.59	2.03
Temperature	15°C	14°C	14°C	14°C	14°C	14°C	14°C	14°C	14°C	14°C	14°C	14°C
Characteristeics of Sediment, Color, Odor, etc.	none	→									→	none

Volume of Sediment from Last One Liter of Development Water: 0

Description of Containers and Containing Area for Water Removed During Pumping: NA Container Size: NA # of Containers: NA

Volume of Any Added Water: NA Source of Any Added Water: NA For Added Water: Temp, pH, Conductivity, Turbidity: NA

Figure 4-4
Well Development Form
Middletown Airfield Site

Project: HIA - Middletown | Site Name: HIA | Location: ERM-25

Date: 8-24-94 | Form Completed by: WARREN FOX FOR - Matt Van Neida | Job Title: Project Geologist

Total Depth of Well: 17.09 | Elevation of Base of Well: Not Surveyed

Initial Water Level (Static) 7.56' | Date Measured: 8-24-94 | Time: 0820

Water Level Immediately Following Development 16.85' | Date Measured: 8-24-94 | Time: 1350

Water Level Afer Development (Static) 6.19' | Date Measured: 8-25-94 | Time: 1540

Method of Development: Bailer / Pump | Type: PVC / Centrifugal | Size: 1 1/2" / — | Make: — / Tanaka

Total Development Time: 5 hours | Total Volume of Water Removed: 36 Gallons | Average Pumping Rate: < 0.5 gal/min.

	Before Pumping		During Pumping		After Pumping
Date and Time 8-24-94	0830	1020	1155	1210	1345
Volume of Water Removed (Gallons)	0	20	10	3	3
Description of Water (Clarity, Particulates, Odor)	Reddish brown	—	—	—	D
pH	6.6	6.2	6.2	6.2	7.0
Conductivity umHos	900	890	1100	1050	1000
Turbidity NTU	67.3	40.7	+200	190.7	+200
Temperature °C	17	18	30	25	25
Characteristeics of Sediment, Color, Odor, etc.	—	—	—	—	—

Volume of Sediment from Last One Liter of Development Water:

Description of Containers and Containing Area for Water Removed During Pumping: Steel Drum | Container Size: 55 Gallon | # of Containers: 1

Volume of Any Added Water: None | Source of Any Added Water: — | For Added Water: Temp —, pH, Conductivity, Turbidity

Figure 4-4
Well Development Form
Middletown Airfield Site

Project: HIA – Middletown | Site Name: HIA | Location: ERM-35

Date: 8-26-94 | Form Completed by: WARREN FOR FOR - Matt VanVeida | Job Title: Project Geologist

Total Depth of Well: 16.54' | Elevation of Base of Well: Not Surveyed

Initial Water Level (Static) 11.53' | Date Measured: 8-26-94 | Time: 0825

Water Level Immediately Following Development 13.27' | Date Measured: 8-26-94 | Time: 1230

Water Level Afer Development (Static) | Date Measured: | Time:

Method of Development:

	Type	Size	Make
Bailer	PVC	1 1/2"	
Pump	Centrifugal	—	Tanaka

Total Development Time: 4 hours | Total Volume of Water Removed: 83 Gallons | Average Pumping Rate: < 0.5 g/min.

	Before Pumping		During Pumping				After Pumping	
Date and Time 8-26-94	0837	1030	1050	1110	1135	1150	1210	1230
Volume of Water Removed (Gallons)	1	54	9	7	4	3	2	3
Description of Water (Clarity, Particulates, Odor)	Dark Gray to Brown	→						
pH	6.3	6.3	6.4	6.5	6.6	6.5	6.2	6.4
Conductivity umHos	650	750	800	790	800	790	800	800
Turbidity NTU	+200	+200	+200	154.2	118.1	150.2	148.2	136.7 / ~~FINAL~~
Temperature °C	18.5	21	22	23	23	22	23	24
Characteristeics of Sediment, Color, Odor, etc.								

Volume of Sediment from Last One Liter of Development Water: Silt/f. sand

Description of Containers and Containing Area for Water Removed During Pumping: Steel Drums | Container Size: 55 Gallon | # of Containers: 2

Volume of Any Added Water: None | Source of Any Added Water: — | For Added Water: Temp —, pH, Conductivity, Turbidity

Figure 4-4
Well Development Form
Middletown Airfield Site

Project: HIA- Middletown | Site Name: HIA | Location: ERM-45

Date: 8-22-94 | Form Completed by: WARREN FOR FOR - Matt VanNieda | Job Title: Project Geologist

Total Depth of Well: 19.62' | Elevation of Base of Well: Not Surveyed

Initial Water Level (Static) 11.39' | Date Measured: 8-22-94 | Time: 1245

Water Level Immediately Following Development ~~19.20'~~ | Date Measured: | Time:

Water Level Afer Development (Static) 11.11' | Date Measured: 8-23-94 | Time: 1625

Method of Development:

	Type	Size	Make
Bailer			
Pump	PVC Centrifugal	1½"	Tanaka

Total Development Time: 4 hours | Total Volume of Water Removed: 125 | Average Pumping Rate: 1.0 G/min

	Before	~~Before~~ Pumping	During Pumping		After Pumping
Date and Time	8-22-94 1245	1500	1550	1605	1630
Volume of Water Removed (Gallons)	1.36	~~25~~	20	20	125 Total
Description of Water (Clarity, Particulates, Odor)	DK. Brown	→	→	→	Partly Cloudy (brown)
pH	6.5	6.3	6.35	6.3	6.3
Conductivity umhos	800	600	650	650	650
Turbidity NTU	101	105.7	—	—	—
Temperature °C	18	19	19	20	20
Characteristeics of Sediment, Color, Odor, etc.	—	→	—	→	→

Volume of Sediment from Last One Liter of Development Water: None/ Some silt

Description of Containers and Containing Area for Water Removed During Pumping: Steel Drums | Container Size: 55 Gallon | # of Containers: 3

Volume of Any Added Water: None | Source of Any Added Water: — | For Added Water: — Temp, pH, Conductivity, Turbidity

Figure 4-4
Well Development Form
Middletown Airfield Site

Project: HIA - Middletown | Site Name: HIA | Location: ERM-5S

Date: 8-23-94 | Form Completed by: WARREN FOX FOR - Matt VanVreede | Job Title: Project Geologist.

Total Depth of Well: 19.29' | Elevation of Base of Well: Not Surveyed

Initial Water Level (Static) 9.11' | Date Measured: 8-23-94 | Time: 1305

Water Level Immediately Following Development 16.08' | Date Measured: 8-23-94 | Time: 1612

Water Level Afer Development (Static) 8.93' | Date Measured: 8-24-94 | Time: 1448

Method of Development:

	Type	Size	Make
Bailer	PVC	1½"	
Pump	Centrifugal	—	Tanaka

Total Development Time: 3 hours | Total Volume of Water Removed: 112 Gallons | Average Pumping Rate: 1.0 Gal/Min

	Before Pumping					During Pumping	After Pumping
Date and Time 8-23-94	1330	1510	1515	1525	1535	1545	1600
Volume of Water Removed (Gallons)	10	50	6	10	11	10	15
Description of Water (Clarity, Particulates, Odor)	Lt Brown	→	→	→	→	Lt Brown	Clean
pH	—	—	—	—	—	—	—
Conductivity umhos	850	850	850	850	850	850	850
Turbidity NTU	200+	200+	31	180.8	11.4	6.7	8.5
Temperature °C	19	19	19.5	19.5	20	20	20
Characteristeics of Sediment, Color, Odor, etc.							

Volume of Sediment from Last One Liter of Development Water: None

Description of Containers and Containing Area for Water Removed During Pumping: Steel Drums | Container Size: 55 Gallon | # of Containers: 2

Volume of Any Added Water: None | Source of Any Added Water: — | For Added Water: Temp, pH, Conductivity, Turbidity —

Figure 4-4
Well Development Form
Middletown Airfield Site

Project: H1A- Middletown Site Name: H1A Location: ERM-6S

Date: 8-22-94 Form Completed by: WARREN FOX for - Matt VanVleet Job Title: Project Geologist

Total Depth of Well: 23.60' Elevation of Base of Well: Not Surveyed

Initial Water Level (Static)	14.12'	Date Measured: 8-22-94	Time:	1000
Water Level Immediately Following Development	14.20'	Date Measured: 8-22-94	Time:	1450
Water Level Afer Development (Static)	13.82'	Date Measured: 8-23-94	Time:	1629

Method of Development:	Type	Size	Make
Bailer	PVC	1½"	
Pump	Centrifugal	—	Tanaka

Total Development Time: 4 hours Total Volume of Water Removed: 130 Gallons Average Pumping Rate: 1.5 gl/min

	Before Pumping	During Pumping	After Pumping
Date and Time 8-22-94	1105	1220	1450
Volume of Water Removed (Gallons)	30	40	60
Description of Water (Clarity, Particulates, Odor)	Brown	Brown	Clear
pH	6.0	6.2	6.3
Conductivity umhos	500	500	500
Turbidity NTU	70.1	93	85.6
Temperature °C	17.5	17	16.5
Characteristeics of Sediment, Color, Odor, etc.	—	—	—

Volume of Sediment from Last One Liter of Development Water: None

Description of Containers and Containing Area for Water Removed During Pumping: Steel Drums Container Size: 55 Gallon # of Containers: 3

Volume of Any Added Water: None Source of Any Added Water: — For Added Water: Temp —, pH, Conductivity, Turbidity

Figure 4-4
Well Development Form
Middletown Airfield Site

Project: USACE - Middletown ACE Site Name: HIA Location: ERM-75 (sent)

Date: 2-9-95 Form Completed by: AllisonPhillips Job Title: Geologist

Total Depth of Well: 142.44' Elevation of Base of Well: Not surveyed

Initial Water Level (Static) 13.6' Date Measured: 2-9-95 Time: 1525

Water Level Immediately Following Development 90.0' Date Measured: 2-9-95 Time: 1730 (well drawn down to pump then allowed to recharge)

Water Level Afer Development (Static) 26.75' Date Measured: Time:

Method of Development:	Type	Size	Make
Bailer	SS	10' x 3"	Hydrogroup
Pump	Jet Sub	2 7/8"	Grundfos

Total Development Time: 2HRS SURGE & BAIL 1HR 27 MIN PUMP Total Volume of Water Removed: ~211 gal + ~76 g from bailing Average Pumping Rate: oscillated between 2.25 - 2.50 gpm

	Before Pumping		During Pumping		After Pumping	
Date and Time 2-9-95	1600	1617	1635	1652	1710	1727
Volume of Water Removed gal	5	43 (38)	85 (42)	127 (42)	169 (42)	211 (42)
Description of Water (Clarity, Particulates, Odor)	slightly yellow turbid →		→	clear →	→	→
pH	7.6	7.5	7.6	7.5	7.5	7.6
Conductivity NTU	600	610	610	610	610	610
Turbidity umhos	61.8	52.3	24.6	7.15	7.08	7.16
Temperature °C	12	12	12	12	12	12
Characteristeics of Sediment, Color, Odor, etc.	no sed → no odor →		→	→	→	→

Volume of Sediment from Last One Liter of Development Water: 0

Description of Containers and Containing Area for Water Removed During Pumping: pumped into 425 g holding tank at staging area Container Size: samples collected in 1L clear glass # of Containers: 6 L total

Volume of Any Added Water: N/A Source of Any Added Water: N/A For Added Water: Temp, pH, Conductivity, Turbidity: N/A

ERM, INC.

DTW = 13.6'
TOC = 142.44'
well vol = 85 gal

set pump 90' into well
pumping rate: 2.25 - 2.50 gpm

PM005.02/MSS/2.24.94

*: DID NOT STABILIZE (turbidity)

Figure 4-4
Well Development Form
Middletown Airfield Site

Project: ACE - Middletown | Site Name: HIA | Location: ERM-7I

Date: 2.27.95 | Form Completed by: Allison Phillips | Job Title: Geologist

Total Depth of Well: 334' | Elevation of Base of Well: Not surveyed

Initial Water Level (Static) 35.2' | Date Measured: 2.23.95 | Time: 0805

Water Level Immediately Following Development | Date Measured: | Time:

Water Level Afer Development (Static) | Date Measured: | Time:

Method of Development:

	Type	Size	Make
Bailer	SS	10'x 3"	HYDROGROUP
Pump	Jet Sub	2 7/8"	Grundfos

Total Development Time: 2 HRS SURGE & BAIL ~3.5 HRS PUMP | Total Volume of Water Removed: ~240 g + ~96g from bailing | Average Pumping Rate: < 1 gpm resorted to bailing well dry.

	Before Pumping			During Pumping			After Pumping	
Date and Time	2.23.95 1417	2.23.95 1437	2.24.95 0800	2.27.95 1245	1830	1350	1415	1445
Volume of Water Removed gal	1st L.	50	100	150	180	200	220	240
Description of Water (Clarity, Particulates, Odor)	yellow color → v. turbid → oil sheen on top →							
pH	7.1	6.8	7.3	7.4	7.5	7.5	7.6	7.6
Conductivity umhos	500	600	600	600	650	650	650	650
Turbidity NTUs	24.9	19.6	24.7	32.5	30.7	68.2	120.9	141.8 *
Temperature °C	10	12	11	12	12	12	12	12
Characteristeics of Sediment, Color, Odor, etc.	oil sheen on top → sed yellowish/red → no odor	increased in vol. as bailed closer to bottom →						

Volume of Sediment from Last One Liter of Development Water: too sm. amt to measure

Description of Containers and Containing Area for Water Removed During Pumping: Direct discharge into storm sewer | Container Size: N/A | # of Containers: N/A

Volume of Any Added Water: N/A | Source of Any Added Water: N/A | For Added Water: N/A
Temp
pH
Conductivity
Turbidity

ERM, INC.

DTW = 35.2'
TOC = 334
Well Vol = 197 gal

pumping rate < 1 gpm
set pump 278' into well
* well yeild @ 7 gph or .11 gpm * MAKES NO WATER

PM005.02/MS5/2.24.94

Figure 4-4
Well Development Form
Middletown Airfield Site

Project: ACE - Middletown Site Name: H1A Location: ERM-7D(sent)

Date: 2·22·95 Form Completed by: Allison Phillips Job Title: Geologist

Total Depth of Well: ~635' Elevation of Base of Well: Not surveyed

Initial Water Level (Static) 86.8' Date Measured: 2·21·95 Time: 1450

Water Level Immediately Following Development 242' Date Measured: 2·22·95 Time: 1800

Water Level Afer Development (Static) 137.35' Date Measured: 2·23·95 Time: 0800

Method of Development:

	Type	Size	Make
Bailer	10'x3" SS	10'x3"	Hydrogroup
Pump	2" Jet Sub	2"	Grundfos

Total Development Time: 45 MIN SURGE 1HR15MIN BAIL 4HRS PUMP Total Volume of Water Removed: 400 gal +~40 gal from bailing Average Pumping Rate: Well yeild ~.44gpm pumped ~ 1gpm until 210', then allowed recharge

	Before Pumping				During Pumping				After Pumping			
Date and Time 2-22-95	1035	1125	1430	1530	1545	1600	1630	1700	1715	1730	1740	1750
Volume of Water Removed gal	1L	150	180	230	240	250	275	325	350	375 385	385	400
Description of Water (Clarity, Particulates, Odor)	no odor slightly turbid →											
pH	9.8	10	9.8	9.6	9.5	9.5	9.5	9.5	9.6	9.5	9.5	9.5
Conductivity umhos	400 400	400 300	400 300	300	300	300	300	300	310	310	300	300
Turbidity NTUs	35.8	17.1	15.6	13.0	12.8	10.0	12.8	13.0	13.1	13.12	12.9	13.14
Temperature °C	12	13	13	12	12	12	12	12	12	12	12	12
Characteristeics of Sediment, Color, Odor, etc.	no sed slightly turbid (chalky colored) water →											

Volume of Sediment from Last One Liter of Development Water:

Description of Containers and Containing Area for Water Removed During Pumping: discharge directly into sewer (storm) 1L sampling jar. Container Size: 1 L sampling jar # of Containers:

Volume of Any Added Water: N/A Source of Any Added Water: N/A For Added Water: N/A
Temp
pH
Conductivity
Turbidity

ERM, INC.

TOC ~ 635'
DTW = 86.8'
Well Vol = 362 gallons

Well yeild ~.44 gpm (v. rough estimate)

Figure 4-4
Well Development Form
Middletown Airfield Site

Project: ACE - Middletown Site Name: HIA Location: ERM-85 (SENT)

Date: 2·10·95 Form Completed by: Allison Phillips Job Title: Geologist

Total Depth of Well: 124.56' Elevation of Base of Well: Not surveyed

Initial Water Level (Static) 29.6' Date Measured: 2·9·95 Time: 1010

Water Level Immediately Following Development 90.0' Date Measured: 2·9·95 Time: 1315 (Well drawn down to pump then allowed to recharge)

Water Level Afer Development (Static) Date Measured: Time:

Method of Development:

	Type	Size	Make
Bailer	SS	10' x 3"	Hydrogroup
Pump	Jet Sub	2"/6"	Grundfos

Total Development Time: 2HRS SURGE & BAIL 2HRS 15MIN PUMP Total Volume of Water Removed: ≈100 gal +≈96g from bailing (bailed dry) Average Pumping Rate: ≈1 gpm intermittent as well vol = 62 gal. Allowed to recharge.

	Before Pumping		During Pumping			After Pumping	
Date and Time 2·9·95	1100	1115	1140	1200	1230	1240	1315
Volume of Water Removed	5 gal	40 gal (35)	55 (15)	70 (16)	80 (10)	90 (10)	100 (10)
Description of Water (Clarity, Particulates, Odor)	slightly turbid	→	→	→	clear	→	→
pH	7.6	7.8	7.5	7.7	7.5	7.6	7.6
Conductivity µmhos	500	550	550	580	600	600	600
Turbidity NTUs	540	7.16	9.31	11.70	3.40	3.65	3.0
Temperature °C	11	13	12	12	13	13	13
Characteristeics of Sediment, Color, Odor, etc.	no sed no odor	→	→	→	→	→	→

Volume of Sediment from Last One Liter of Development Water: 0

Description of Containers and Containing Area for Water Removed During Pumping: pumped into 425g holding tank at staging area. Container Size: samples collected in 1L clear glass # of Containers: 7L total

Volume of Any Added Water: N/A Source of Any Added Water: N/A For Added Water: Temp, pH, Conductivity, Turbidity: N/A

ERM, INC. PM005.02/MSS/2.24.94

well volume = 63 gal (removed 1.5 vol.)
DTW = 29.6'
TOC = 124.56'

set pump 90' into well
pump rate = 1 gpm

Figure 4-4
Well Development Form
Middletown Airfield Site

Project: ACE-Middletown | Site Name: H1A | Location: ERM-81 (sent)

Date: 2-28-95 | Form Completed by: Allison Phillips | Job Title: Geologist

Total Depth of Well: 342' | Elevation of Base of Well: Not surveyed

Initial Water Level (Static)	Date Measured: 2-28-95	Time: 1245
Water Level Immediately Following Development	Date Measured:	Time:
Water Level Afer Development (Static)	Date Measured:	Time:

Method of Development:	Type	Size	Make
Bailer	SS	10' x 3"	Hydrograv
Pump	Jet Sub	2 7/8"	Grundfos

Total Development Time: 1HRS SURGE & BAIL, 4HRS PUMP | Total Volume of Water Removed: 500g + ~7kg from bailing | Average Pumping Rate: ON 2-28-95 @ 2gpm, ON 3-1-95 @ 3.3 gpm

	Before Pumping		During Pumping		After Pumping	
Date and Time	2-28-95 1250	2-28-95 1340	2-28-95 1430	3-1-95 1130	3-1-95 1200	3-1-95 1230
Volume of Water Removed gal	1st L	100g	200g	300g	400g	500g
Description of Water (Clarity, Particulates, Odor)	very turbid (tannish white color) no odor			clear but distinct GREEN TINT No odor		
pH	6.8	6.7	7.1	7.0	7.1	7.1
Conductivity	700	900	700	800	900	900
Turbidity	55.5	179.9	117.9	14.3	9.1	9.3
Temperature	11	12	12	12	13	12
Characteristeics of Sediment, Color, Odor, etc.	not sufficient vol. of sed to note →					

Volume of Sediment from Last One Liter of Development Water: 0

Description of Containers and Containing Area for Water Removed During Pumping: Direct discharge into storm sewers | Container Size: N/A | # of Containers: N/A

Volume of Any Added Water: N/A | Source of Any Added Water: N/A | For Added Water: N/A — Temp, pH, Conductivity, Turbidity

ERM, INC.

DTW = 342'
TOC = 53.9'
Well volume = 190 gal

Set pump 336' in well

PM005.02/MSS/2.24.94

Figure 4-4
Well Development Form
Middletown Airfield Site

Project: ACE-Middletown Site Name: HA Location: ERM-8D

Date: 2·27·95 Form Completed by: Allyson Phillips Job Title: Geologist

Total Depth of Well: ~645' Elevation of Base of Well: Not Surveyed

Initial Water Level (Static) 149.6' Date Measured: 2·27·95 Time: 0930

Water Level Immediately Following Development Date Measured: Time:

Water Level Afer Development (Static) Date Measured: 2·28·95 Time: 0800

Method of Development:

	Type	Size	Make
Bailer	SS	10'x3"	HYDROSCOOP
Pump	Jet Sub	2 7/8"	Grundfos

Total Development Time: 2HRS SURGE & BAIL 4HRS PUMP Total Volume of Water Removed: 900 gal + ~7ug from bailing Average Pumping Rate: ~3.33 gpm

	Before Pumping		During Pumping			After Pumping	
Date and Time 2·27·95	1115	1145	1215	1300	1345	1430	1515
Volume of Water Removed gal	1st L	150	300	450	600	750	900
Description of Water (Clarity, Particulates, Odor)	slightly turbid (chalky white) no odor →		clear → no odor →				
pH	7.2	7.4	7.5	7.8	7.8	7.9	7.9
Conductivity umhos	600	500	450	450	400	400	400
Turbidity NTUs	22.4	10.6	8.3	10.4	11.0	11.2	10.8
Temperature °C	11	12	12	12	12	12	12
Characteristeics of Sediment, Color, Odor, etc.	no sed →						

Volume of Sediment from Last One Liter of Development Water: 0

Description of Containers and Containing Area for Water Removed During Pumping: Direct discharge into storm sewer Container Size: N/A # of Containers: N/A

Volume of Any Added Water: N/A Source of Any Added Water: N/A For Added Water: N/A
Temp
pH
Conductivity
Turbidity

ERM, INC.

DTW = 149.6'
TOC ~ 645'
Well Vol = 326.7 gal

set pump 378' into well
pumping rate = 3.33 gpm (constant thru 4 hrs)

PM005.02/MSS/2.24.94

Figure 4-4
Well Development Form
Middletown Airfield Site

Project: USACE Site Name: HIA Location: ERM-95

Date: 4-28-95 Form Completed by: W. Fox for (S. Lane) Job Title: P. Geologist.

Total Depth of Well: ≈158' Elevation of Base of Well: Not Surveyed

Initial Water Level (Static): 46.25' Date Measured: 4-28-95 Time: 0828

Water Level Immediately Following Development: 84.13' Date Measured: 4-28-95 Time: 1126

Water Level Afer Development (Static) Date Measured: Time

Method of Development:

	Type	Size	Make
Bailer			
Pump	S. Steel Jet Sub.	2" x 10'	Hydrogroup Grundfos

Total Development Time: ≈ 24 hours Total Volume of Water Removed: 200 Gallons Average Pumping Rate: 2 gallons Per Minute

	Before Pumping				During Pumping				After Pumping			
Date and Time 4-28-95	0904	0917	0930	0944	0953	1005	1019	1025	1035	1045	1055	1105
Volume of Water Removed Gallons	1	18	44	50	56	80	108	120	140	160	180	200
Description of Water (Clarity, Particulates, Odor)	Turbid cloudy		Translucent								D	
pH	7.6	7.3	7.5	7.5	7.5	7.6	7.6	7.8	7.6	7.6	7.9	7.7
Conductivity umHos	1000	500	470	470	470	470	470	470	470	470	470	460
Turbidity NTU	37.2	40	46.2	151.5	181.5	>200	>200	168.3	>200	>200	154.7	168.1
Temperature °C	14	14	14	14	14	15	15	15	15	15	15	15
Characteristeics of Sediment, Color, Odor, etc.	Brown fines							Trace of	fines/silts			

Volume of Sediment from Last One Liter of Development Water: Trace of (fine) silts

Description of Containers and Containing Area for Water Removed During Pumping: NA Container Size: NA # of Containers: NA

Volume of Any Added Water: NA Source of Any Added Water: NA For Added Water: Temp, pH, Conductivity, Turbidity: NA

Figure 4-4
Well Development Form
Middletown Airfield Site

Project: ACE - Middletown   Site Name: HIA   Location: ERM-9I (SENY)

Date: 3-2-95   Form Completed by: Allison Phillips   Job Title: Geologist

Total Depth of Well: 352'   Elevation of Base of Well: Not surveyed

Initial Water Level (Static) 63.4'   Date Measured: 3-9-95   Time: 1030

Water Level Immediately Following Development   Date Measured: Time:

Water Level Afer Development (Static)   Date Measured: Time:

Method of Development:	Type	Size	Make
Bailer	SS	10' x 3"	HYDROGROUP
Pump	Jet Sub	2 7/8"	Grundfos

Total Development Time: 2HRS SURGE & BAIL 4HRS PUMP   Total Volume of Water Removed: 600 gal + ≈ 72 g from bailing   Average Pumping Rate: @ 4gpm

	Before Pumping		During Pumping			After Pumping	
Date and Time	3-2-95 1515	3-2-95 1530	3-2-95 1615	3-2-95 1645	3-3-95 0845	3-3-95 0915	3-3-95 0945
Volume of Water Removed gal	1st L	100	200	300	400	500	600
Description of Water (Clarity, Particulates, Odor)	turbid (yellow green tint) no odor →	→	→	Clear W/ green tint →	→	→	→
pH	8.5	8.0	7.8	7.7	7.6	7.6	7.4
Conductivity umhos	400	400	400	390	390	380	380
Turbidity NTUs	46.9	13.0	27.9	11.3	10.8	11.1	10.4
Temperature °C	12	13	13	13	13	13	12
Characteristeics of Sediment, Color, Odor, etc.	NO SED →	→	→	→	→	→	→

Volume of Sediment from Last One Liter of Development Water: 0

Description of Containers and Containing Area for Water Removed During Pumping: Direct Discharge into Storm Sewer   Container Size: N/A   # of Containers: N/A

Volume of Any Added Water: N/A   Source of Any Added Water: N/A   For Added Water: N/A
Temp
pH
Conductivity
Turbidity

ERM, INC.   Pump set 336' in well (16 pieces)   [illegible]/MSS/2.24.94

TOC = 352'
DTW = 63.4'
Well vol = 190 gal.

Figure 4-4
Well Development Form
Middletown Airfield Site

Project: ACE - Middletown Site Name: H1A Location: ERM-9D(GENT)

Date: 3-2-95 Form Completed by: Allison Phillips Job Title: Geologist

Total Depth of Well: 670' Elevation of Base of Well: Not surveyed

Initial Water Level (Static) 165.3' Date Measured: 3-1-95 Time: 0730

Water Level Immediately Following Development Date Measured: Time:

Water Level Afer Development (Static) Date Measured: Time:

Method of Development:

	Type	Size	Make
Bailer	SS	10' x 3"	HYDROGROUP
Pump	Jet Sub	2 7/8"	Grundfos

Total Development Time: 2HRS SURGED BAIL 4HRS PUMP Total Volume of Water Removed: 900g +~76g from bailing Average Pumping Rate: @ 3.5 gpm to 4 gpm

	Before Pumping		During Pumping			After Pumping	
Date and Time 3-2-95	0840	0915	1005	1055	1130	1200	1230
Volume of Water Removed gal	1st L	150	300	450	600	750	900
Description of Water (Clarity, Particulates, Odor)	turbid (yellow) no odor →				clear →		
pH	7.4	7.3	7.5	9.3	9.3	9.3	9.2
Conductivity umhos	450	500	490	450	480	480	486
Turbidity NTUs	75.7	31.9	64.0	52.3	9.7	9.9	9.7
Temperature °C	10	11.5	12	12	12	12	12
Characteristeics of Sediment, Color, Odor, etc.	no sed →						

Volume of Sediment from Last One Liter of Development Water: 0

Description of Containers and Containing Area for Water Removed During Pumping: Direct discharge into storm sewer Container Size: N/A # of Containers: N/A

Volume of Any Added Water: N/A Source of Any Added Water: N/A For Added Water: Temp, pH, Conductivity, Turbidity: N/A

ERM, INC.

TOC 670'
DTW = 165.3'
wellvol = 338 gal

Set pump 399' in well. 119 pieces

PM005.02/MSS/2.24.94

Figure 4-4
Well Development Form
Middletown Airfield Site

Project: USACE Site Name: HIA Location: ERM-10I

Date: 3/24/95 Form Completed by: Scott Lane Job Title: Env. Field. Tech.

Total Depth of Well: 99.45 Elevation of Base of Well: Not Surveyed

Initial Water Level (Static) Date Measured: Time:

Water Level Immediately Following Development 13.94' Date Measured: 3/22/95 Time: 10:05

Water Level Afer Development (Static) 15.26' Date Measured: 3/22/95 Time: 11:26

Method of Development:

	Type	Size	Make
Bailer	SS	10' x 1 2/8"	Hydrogroup
Pump	Jet Sub.		Grundfos

Total Development Time: bailed and surged for 2 hrs. pumped for 36 mins. Total Volume of Water Removed: 10 gals. bailed 148 gals. pumped Average Pumping Rate: 4 gal./min.

	Before Pumping				During Pumping				After Pumping			
Date and Time 3/22/95	10:28	10:35	10:39	10:44	10:49	10:54	10:59	11:04				
Volume of Water Removed	1st gal.	28 gal	44 gal.	64 gal	84 gal	104 gal.	124 gal.	144 gal				
Description of Water (Clarity, Particulates, Odor)	Cloudy	clear	clear	clear	clear	clear	clear	clear				
pH	7.6	7.2	7.3	7.2	7.3	7.2	7.3	7.3				
Conductivity	500	500	500	500	500	500	500	500				
Turbidity	41.1	5.68	2.74	2.71	3.14	2.27	3.05	3.03				
Temperature	14°c	14°c	14°c	14°c	14°c	14°c	14°c	14°c				
Characteristeics of Sediment, Color, Odor, etc.	none											None

Volume of Sediment from Last One Liter of Development Water: 0

Description of Containers and Containing Area for Water Removed During Pumping: NA Container Size: NA # of Containers: NA

Volume of Any Added Water: NA Source of Any Added Water: NA For Added Water: NA
Temp
pH
Conductivity
Turbidity

Figure 4-4
Well Development Form
Middletown Airfield Site

Project: HIA - Middletown Site Name: HIA Location: ERM - 115

Date: 8-25-94 Form Completed by: WARREN FOF FOR - Matt VanWeida Job Title: Project Geologist

Total Depth of Well: 23.34 Elevation of Base of Well: Not Surveyed

Initial Water Level (Static) 9.02' Date Measured: 8-25-94 Time: 1245
Water Level Immediately Following Development 20.98' Date Measured: 8-25-94 Time: 1620
Water Level Afer Development (Static), 8.75 Date Measured: 8-26-94 Time: 1426

Method of Development:

	Type	Size	Make
Bailer	PVC	1½"	
Pump	Centrifugal	—	Tanaka

Total Development Time: 3½ hours Total Volume of Water Removed: ≅ 35 Gallons Average Pumping Rate: ≤ .25 g/min.

	Before Pumping	During Pumping			Last ~~After~~ Pumping
Date and Time 8-25-94	1310	1500	1553	1600	1614
Volume of Water Removed (Gallons)	5	16	7	3	3
Description of Water (Clarity, Particulates, Odor)	ORANGE BROWN	→	→	→	→
pH	6.6	6.9	6.1	6.3	6.5
Conductivity umhos	500	500	350	270	335
Turbidity NTU	+200	+200	+200	127	125.5 / @1620 (FINA) +200
Temperature °C	19.5	27*	30*	22.5*	27.5*
Characteristeics of Sediment, Color, Odor, etc.	—	—	—	—	—

Volume of Sediment from Last One Liter of Development Water:

Description of Containers and Containing Area for Water Removed During Pumping: Steel Drum Container Size: 55 Gallon # of Containers: 1

Volume of Any Added Water: None Source of Any Added Water: — For Added Water: Temp —, pH, Conductivity, Turbidity

Notes: * Centrifugal Pump heated water - slow pumping rate.

Figure 4-4
Well Development Form
Middletown Airfield Site

Project: USACE Site Name: HIA Location: ERM - II I

Date: 3/13/95 Form Completed by: Scott Lane Job Title: Env. Field Tech.

Total Depth of Well: 97.61' Elevation of Base of Well: No Surveyed

Initial Water Level (Static) 10.31' Date Measured: 3/13/95 Time: 09:00

Water Level Immediately Following Development Date Measured: Time:

Water Level Afer Development (Static) 9.36' Date Measured: 3/13/95 Time: 12:59

Method of Development:	Type	Size	Make
Bailer	PVC	3" x 1 1/2"	
Pump	jet sub.	2 7/8"	Grundfos

Total Development Time: 2 hrs. 5 min. Total Volume of Water Removed: 57 gal. Average Pumping Rate: bailed by hand

	Before Pumping		During Pumping		After Pumping	
Date and Time 3/13/95	10:47	11:15	11:37	12 25	1238	12:52
Volume of Water Removed	1st gal.	11 gal.	21 gal.	45 gal.	50 gal	57 gal.
Description of Water (Clarity, Particulates, Odor)	cloudy, brown in color no oder	cloudy brown in color no oder	clear no oder	→	→	clear no oder
pH	7.0	7.3	7.4	7.2	7.2	7.1
Conductivity	500	600	600	600	600	600
Turbidity	104.9	40.2	8.4	5.6	3.6	3.6
Temperature	12°C	13°C	13°C	13°C	13°C	13°C
Characteristeics of Sediment, Color, Odor, etc.	none	→	→	→	→	none

Volume of Sediment from Last One Liter of Development Water:

Description of Containers and Containing Area for Water Removed During Pumping: Direct discharge Container Size: NA # of Containers: NA

Volume of Any Added Water: NA Source of Any Added Water: NA For Added Water: Temp, pH, Conductivity, Turbidity: NA

Figure 4-4
Well Development Form
Middletown Airfield Site

Project: HIA - Middletown Site Name: HIA Location: ERM-12S

Date: 8-~~11~~-95 (WD) 8-25-94 Form Completed by: WARREN FOP FOR Matt VanNeida Job Title: Project Geologist

Total Depth of Well: 20.69' Elevation of Base of Well: Not Surveyed

Initial Water Level (Static) 0.18' Date Measured: 8-25-94 Time: 0920

Water Level Immediately Following Development 8.34' Date Measured: 8-25-94 Time: 1200

Water Level Afer Development (Static) 1.17' Date Measured: 8-26-94 Time: 1432

Method of Development:

	Type	Size	Make
Bailer	PVC	1½"	
Pump	Centrifugal	—	Tanaka

Total Development Time: 3 hours Total Volume of Water Removed: ≅ 110 Gallons Average Pumping Rate: 3.5 g/m.

	Before Pumping	During Pumping		After Pumping (WD last reading)
Date and Time 8-25-94	0930	1135	1142	1150
Volume of Water Removed (Gallons)	0	60	25	20
Description of Water (Clarity, Particulates, Odor)	Clear	ORANGE BROWN		Clear
pH	5.6	5.8	5.2	5.2
Conductivity umhos	340	320	315	325
Turbidity NTU	22.8	+200	77.5	(After) 9.49 10.79
Temperature °C	20	18	18	18
Characteristeics of Sediment, Color, Odor, etc.	—	—	—	—

Volume of Sediment from Last One Liter of Development Water: Clear.

Description of Containers and Containing Area for Water Removed During Pumping: Steel Drums Container Size: 55 Gallon # of Containers: 2

Volume of Any Added Water: None Source of Any Added Water: — For Added Water: Temp, pH, Conductivity, Turbidity —

Figure 4-4
Well Development Form
Middletown Airfield Site

Project: HIA - Middletown | Site Name: HIA | Location: ERM - 12I

Date: 9-8-94 | Form Completed by: WARREN FOR FOR - MATT VanVelde | Job Title: Project Geologist

Total Depth of Well: | Elevation of Base of Well: Not Surveyed

Initial Water Level (Static) | Date Measured: 9-8-94 | Time:

Water Level Immediately Following Development 81.38' | Date Measured: 9-8-94 | Time: 1306

Water Level Afer Development (Static) | Date Measured: | Time:

Method of Development: Bailer / Pump Submersible Centrifugal (WF) | Type: PVC | Size: 1 1/4" / 2" | Make: ~~Fematal~~ (WF) Grundfos

Total Development Time: 4 hours | Total Volume of Water Removed: ≈ 30 Gallons | Average Pumping Rate: ≈ 0.3 g/m.

	Before Pumping		During Pumping				After Pumping	
Date and Time 9-8-94	0855	1110	1126	1142	1210	1230	1245	1258
Volume of Water Removed (Gallons)	0	13	5	2	2	2	2	2
Description of Water (Clarity, Particulates, Odor)	Cloudy	→						
pH	7.1	7.5	7.3	7.3	7.6	7.3	7.4	7.3
Conductivity umHos	500	435	550	700	600	700	700	700
Turbidity NTU	+200	+200	91.4	87.3	+200	183.5	160.2	178.7
Temperature °C	13	15	18.5	23	26	28	28	28
Characteristeics of Sediment. Color, Odor, etc.	—	—	—	—	—	—	—	—

Volume of Sediment from Last One Liter of Development Water:

Description of Containers and Containing Area for Water Removed During Pumping: Steel Drum | Container Size: 55 gallon | # of Containers: 1

Volume of Any Added Water: None | Source of Any Added Water: — | For Added Water: Temp, pH, Conductivity, Turbidity: —

Figure 4-4
Well Development Form
Middletown Airfield Site

Project: USACE Site Name: HIA Location: ERM-13S

Date: 4-3-95 Form Completed by: Scott Lane Job Title: Env. Field. Tech.

Total Depth of Well: 30.59' Elevation of Base of Well: Not Surveyed

Initial Water Level (Static) 12.67' Date Measured: 4-3-95 Time 0800

Water Level Immediately Following Development 14.43' Date Measured: 4-3-95 Time: 11:05

Water Level Afer Development (Static) 13.18' Date Measured: 4-3-95 Time: 14:10

Method of Development:

	Type	Size	Make
Bailer	S.S.	10' x 1½"	Hydrogroup
Pump	Jet Sub.		Grundfos

Total Development Time: 2 hrs. 15 mins Surged and bailed pumped for 2 hrs. and 2 mins. Total Volume of Water Removed: 25 gal. bailed ~~228~~ gals. pumped (SL) 128 Average Pumping Rate: 1 gpm.

	Before Pumping				During Pumping				After Pumping			
Date and Time 4-3-95	1150	12:10	12:27	12:35	12:48	12:58	13:08	1324	13:38	1344	1347	1351
Volume of Water Removed	1st gal	20 gal	37 gal.	45 gal	58 gal.	68 gal.	78 gal.	102 gal	114 gal	120 gal.	123 gal	127 gal
Description of Water (Clarity, Particulates, Odor)	cloudy dark reddish brown	cloudy dark reddish brown	cloudy dark reddish brown	cloudy dark reddish brown	cloudy brown	cloudy brown	cloudy brown	cloudy brown	Slightly cloudy brown	slightly cloudy brown	slightly cloudy brown	slightly cloudy brown
pH	7.5	7.3	7.1	7.2	7.1	7.1	7.3	7.2	7.2	7.2	7.1	7.1
Conductivity	500	600	500	490	490	490	(SL) ~~600~~ 490	600	500	500	600	600
Turbidity	off scale	off scale	139.7	118.0	95.5	65.8	60.7	44.1	38.1	33.3	31.6	32.6
Temperature	13°c	14°c	14°c	14°c	14°c	14°c	14°c	15°c	14°c	14°c	14°c	14°c
Characteristeics of Sediment, Color, Odor, etc.	(SL) ~~slight~~ brown silt	reddish brown silt										reddish brown silt

Volume of Sediment from Last One Liter of Development Water: Approx. 6 grams of reddish brown silt.

Description of Containers and Containing Area for Water Removed During Pumping: NA Container Size: NA # of Containers: NA

Volume of Any Added Water: NA Source of Any Added Water: NA For Added Water: Temp, pH, Conductivity, Turbidity: NA

Figure 4-4
Well Development Form
Middletown Airfield Site

Project: USACE Site Name: HIA Location: ERM-13I

Date: 9-2-94 Form Completed by: W. Fop Job Title: P. Geologist

Total Depth of Well: 101.25' Elevation of Base of Well: Not Surveyed

Initial Water Level (Static): ~~16.82~~ 14.92 (WL) Date Measured: 9-2-94 Time: 0920

Water Level Immediately Following Development: 14.52' Date Measured: 9-2-94 Time: 1345

Water Level Afer Development (Static): 12.32' Date Measured: 9-7-94 Time: 0855

Method of Development:

	Type	Size	Make
Bailer	PVC	2"	Hydrogroup
Pump	Jet Sub.	2"	Grundfos

Total Development Time: 4 hours Total Volume of Water Removed: 120 Gallons Average Pumping Rate: 2.25GPM

	Before Pumping			During Pumping					After Pumping
Date and Time	9-2-94 ~~1140~~ 1245	1255	1305	1315	1320	1325	1330	1335	1340
Volume of Water Removed (Gallons)	2.0	25	47	69	80	90	100	110	120
Description of Water (Clarity, Particulates, Odor)	Brown cloudy	"	Trans/Incr+	"	"	"	"	"	clear
pH	7.3	7.2	7.1	7.1	7.1	7.0	7.0	7.1	7.0
Conductivity umHos	485	490	485	480	465	490	485	480	485
Turbidity NTU	72.0	33.4	23.4	48.3	17.2	26.4	10.3	6.9	8.0
Temperature °C	17.0	16.0	15	15	15	15	15	15	15.0
Characteristeics of Sediment, Color, Odor, etc.	cloudy brown	"	"	Brown sl+					clear/traces only

Volume of Sediment from Last One Liter of Development Water: Trace of fines (clear water)

Description of Containers and Containing Area for Water Removed During Pumping: NA Container Size: NA # of Containers: NA

Volume of Any Added Water: NA Source of Any Added Water: NA For Added Water: Temp, pH, Conductivity, Turbidity: NA

Figure 4-4
Well Development Form
Middletown Airfield Site

Project: USACE Site Name: HIA Location: ERM-14S

Date: 3-30-95 Form Completed by: Scott Lane Job Title: Env. Field. Tech.

Total Depth of Well: 33.21' Elevation of Base of Well: Not Surveyed

Initial Water Level (Static) Date Measured: Time:

Water Level Immediately Following Development: 23.92 Date Measured: 3-30-95 Time: 14:00

Water Level Afer Development (Static): 29.31' Date Measured: 3-30-95 Time: 17:11

Method of Development:

	Type	Size	Make
Bailer	S.S.	10'x1½"	Hydrogroup
Pump	Jet Sub.		Grundfos

Total Development Time: Surged/bailed 2 hrs. pumped for 2 hrs. Total Volume of Water Removed: approx. 6 gals. bailed 8 gal. pumped Average Pumping Rate: approx. 35 gpm

	Before Pumping			During Pumping					After Pumping			
Date and Time	3-30-95 1441			1500	1517	1534	1555	1615	1641			
Volume of Water Removed	.5 gal.			4 gal.	4.5 gal.	6. gal.	7 gal.	7.5 gal.	8 gal.			
Description of Water (Clarity, Particulates, Odor)	dark reddish brown			dark reddish brown	dark reddish brown	dark reddish brown	dark reddish brown	dark reddish brown	dark reddish brown			
pH	7.3			7.2	7.4	7.2	7.2	7.2	7.2			
Conductivity	700			800	700	700	700	700	700			
Turbidity	off scale			off scale	off scale	off scale	off scale	off scale	off scale			
Temperature	15°C			15°C	16°C	16°C	16°C	15°	15°C			
Characteristeics of Sediment, Color, Odor, etc.	reddish brown silt			reddish brown silt	reddish brown silt	reddish brown silt	reddish brown silt	reddish brown silt	reddish brown silt			

Volume of Sediment from Last One Liter of Development Water: 0

Description of Containers and Containing Area for Water Removed During Pumping: NA Container Size: NA # of Containers: NA

Volume of Any Added Water: NA Source of Any Added Water: NA For Added Water: NA
Temp
pH
Conductivity
Turbidity

Figure 4-4
Well Development Form
Middletown Airfield Site

Project: USACE Site Name: HIA Location: ERM-141

Date: 9-2-94 (8-5) 94 Form Completed by: W. Fox Job Title: P. Geologist

Total Depth of Well: 107.70' Elevation of Base of Well: Not Surveyed

Initial Water Level (Static): 18.21' Date Measured: 9-2-94 Time: 0815

Water Level Immediately Following Development: 17.43' Date Measured: 9-2-94 Time: 1147

Water Level Afer Development (Static): 14.30' Date Measured: 9-7-94 Time: 0845

Method of Development:

	Type	Size	Make
Bailer	PVC	2"	Hydrogroup
Pump	Jet Sub.	2"	Grundfos

Total Development Time: 3hrs 45 min. Total Volume of Water Removed: ≈175 gallons Average Pumping Rate: 2.5 to 3.0 GPM

	Before Pumping				During Pumping				After Pumping		
Date and Time 9-2-94 (8-5)	0815	1028	1040	1050	1100	1110	1118	1125	1130	1139	1143
Volume of Water Removed gallons	0	2	30	50	70	93	112	127	137	165	175
Description of Water (Clarity, Particulates, Odor)	Very Turbid	"	"	P. Cloudy	"	"	Translucent	"	"	"	Clear
pH	6.9	6.9	6.9	6.9	6.9	7.0	7.0	7.0	7.0	7.0	7.0
Conductivity mmHos	670	650	650	650	650	700	650	650	650	650	700
Turbidity NTU	7200	"	"	728	70.3	63.2	23.3	15.2	73.7	23.1	13.8
Temperature °C	17	16	15	15	15	15	15	15	15	15	15
Characteristeics of Sediment, Color, Odor, etc.	Brown silt	"	"	"	No	Sediment	→				

Volume of Sediment from Last One Liter of Development Water: Clear / no sediment.

Description of Containers and Containing Area for Water Removed During Pumping: NA Container Size: NA # of Containers: NA

Volume of Any Added Water: NA Source of Any Added Water: NA For Added Water: Temp, pH, Conductivity, Turbidity: NA

Figure 4-4
Well Development Form
Middletown Airfield Site

Project: HIA - Middletown Site Name: HIA Location: ERM - 15I

Date: 9-7-94 Form Completed by: WARREN FOX for Matt VanNeida Job Title: Project Geologist

Total Depth of Well: Elevation of Base of Well: Not Surveyed

Initial Water Level (Static) Date Measured: 9-7-94 Time:

Water Level Immediately Following Development 29.73' Date Measured: 9-7-94 Time: 1630

Water Level Afer Development (Static) 14.60' Date Measured: 9-8-94 Time: 1422

Method of Development:

	Type	Size	Make
Bailer	PVC	1¼"	
Pump	~~Centrifugal~~ Submersible	2"	~~Yamada~~ (WD) Grundfos

Total Development Time: Total Volume of Water Removed: 111 Gallons Average Pumping Rate: 2.5 gl/min.

	Before Pumping		During Pumping			After Pumping	
Date and Time 8-7-94	1335	1545	1552	1602	1608	1616	1625
Volume of Water Removed (Gallons)	0	24	16	18	10	14	19
Description of Water (Clarity, Particulates, Odor)	Reddish Brown →						Clear
pH	7.8	7.6	7.6	7.5	7.5	7.5	7.55
Conductivity umHos	310	310	320	320	320	315	320
Turbidity NTU	+200	+200	43.1	15.6	26.2	164.3	9.4
Temperature °C	15	15	14.5	14.5	14.5	14	14
Characteristeics of Sediment, Color, Odor, etc.	—	—	—	—	—	—	—

Volume of Sediment from Last One Liter of Development Water: —

Description of Containers and Containing Area for Water Removed During Pumping: Steel Drums Container Size: 55 gallon # of Containers: 2

Volume of Any Added Water: None Source of Any Added Water: — For Added Water: Temp, pH, Conductivity, Turbidity —

Figure 4-4
Well Development Form
Middletown Airfield Site

Project: USACE Site Name: HIA Location: ERM-16S

Date: 3-28-95 Form Completed by: Scott Lane Job Title: Env. Field Tech.

Total Depth of Well: 43.75' Elevation of Base of Well: Not Surveyed

Initial Water Level (Static) 9.93' Date Measured: 3/28/95 Time: 12:30

Water Level Immediately Following Development 16.14' Date Measured: 3/28/95 Time: 15:20

Water Level Afer Development (Static) 18.50' Date Measured: 3/28/95 Time 17:49

Method of Development:	Type	Size	Make
Bailer	S.S.	10'x1 3/8"	Hydrogroup
Pump	~~Jet Sub.~~ SL Purged w/ bailer	36"x1½"	~~Grundfos~~ SL

Total Development Time: ~~Purged~~/bailed 2hrs 15 mins. purged w/ bailer for 2hrs

Total Volume of Water Removed: bailed 45 gals. purged w/ bailer 45gal.

Average Pumping Rate: about 2.5 gal./min.

	Before Pumping				During Pumping				After Pumping			
Date and Time 3/28/95	15:35	15:50	16:05	16:20	16:35	16:52	17:09	17:21	17:33	17:45		
Volume of Water Removed	1st gal	5 gal.	10 gal.	15 gal.	20 gal.	25 gal.	30 gal.	35 gal.	40 gal.	45 gal.		
Description of Water (Clarity, Particulates, Odor)	Cloudy brownish red dk	cloudy brown dark	cloudy brown (dark)	cloudy brown	cloudy brown	cloudy brown	Cloudy brown	cloudy brown	cloudy brown	cloudy brown		
pH	6.4	6.0	6.2	6.3	6.2	6.2	6.2	6.1	6.1	6.1		
Conductivity	120	115	140	150	140	140	120	120	120	110		
Turbidity	off scale	→								→ off scale		
Temperature	13°C	14°C	14°C	14°C	14°C	14°C	15°C	15°C	15°C	15°C		
Characteristeics of Sediment, Color, Odor, etc.	brownish red	→						→ brownish red	none	none		

Volume of Sediment from Last One Liter of Development Water: 0

Description of Containers and Containing Area for Water Removed During Pumping: NA Container Size: NA # of Containers: NA

Volume of Any Added Water: NA Source of Any Added Water: NA For Added Water: NA
Temp
pH
Conductivity
Turbidity

Figure 4-4
Well Development Form
Middletown Airfield Site

Project: USACE | Site Name: HIA | Location: ERM-16I

Date: 9-1-94 | Form Completed by: W. Foy | Job Title: Project Geologist

Total Depth of Well: 101.14 | Elevation of Base of Well: Not Surveyed

Initial Water Level (Static) 17.2' | Date Measured: 9-1-94 | Time: 1645

Water Level Immediately Following Development 13.46 | Date Measured: " | Time: 1710

Water Level Afer Development (Static) | Date Measured: | Time

Method of Development:

	Type	Size	Make
Bailer	PVC.	2"	Hydrogroup
Pump	Jet Sub.	2"	Grundfos

Total Development Time: ≈3 hours | Total Volume of Water Removed: ~~90~~ 105 (WE) Gallons | Average Pumping Rate: 5 gallons/min.

	Before Pumping				During Pumping					After Pumping			
Date and Time	9-1-94	@ 1440			1650	1654	1656	1658		1701			
Volume of Water Removed	0	Gallons			35	55	65	75		90			
Description of Water (Clarity, Particulates, Odor)	Transparent												
pH		6.4			6.1	6.2	6.2	6.2		6.2			
Conductivity umhos		305			245	220	220	215		220			
Turbidity NTU		14.75			5.92	2.82	1.60	1.64		1.30			
Temperature °C		21°			18.5	16.5	16.0	15.5		16			
Characteristeics of Sediment, Color, Odor, etc.	None												

Volume of Sediment from Last One Liter of Development Water: Clear | no sediment.

Description of Containers and Containing Area for Water Removed During Pumping: NA | Container Size: NA | # of Containers: NA

Volume of Any Added Water: NA | Source of Any Added Water: NA | For Added Water: Temp, pH, Conductivity, Turbidity: NA

Figure 4-4
Well Development Form
Middletown Airfield Site

Project: USACE Site Name: HIA Location: ERM-17S

Date: 3-29-95 Form Completed by: Scott Lane Job Title: Env. Field. Tech.

Total Depth of Well: 44.51' Elevation of Base of Well: Not Surveyed

Initial Water Level (Static) 24.19' Date Measured: 3-29-95 Time: 08:15

Water Level Immediately Following Development 25.33' Date Measured: 3-29-95 Time: 10:55

Water Level Afer Development (Static) 25.76' Date Measured: 3-29-95 Time: 13:05

Method of Development:	Type	Size	Make
Bailer	S.S.	10K 1½"	Hydrogroup
Pump	Jet Sub.		Grundfos

Total Development Time: Surged/bailed 2 hrs. Pumped 1 hr. 15 mins. Total Volume of Water Removed: bailed 10 gal. pumped 74 gal. Average Pumping Rate: 1 gpm.

	Before Pumping				During Pumping				After Pumping			
Date and Time 3-29-95	1128	1145	1153	1202	1211	1216	1220	1224	1228	1233	1237	1242
Volume of Water Removed	1st gal.	17 gal.	25 gal	34 gal	43 gal	48 gal.	52 gal.	56 gal.	60 gal.	65 gal.	69 gal.	74 gal.
Description of Water (Clarity, Particulates, Odor)	cloudy dark red/brown	slightly cloudy	clear	→							→	clear
pH	6.6	5.8	5.6	5.6	5.6	5.6	5.6	5.6	5.6	5.6	5.6	5.5
Conductivity	210	220	220	220	220	220	220	220	220	210	210	210
Turbidity	off scale	24.6	16.66	9.65	7.66	7.19	5.58	5.67	4.95	4.80	4.42	3.75
Temperature	16°C	17°C	17°C	17°C	17°C	17°C	16°C	17°C	17°C	17°C	17°C	16°C
Characteristeics of Sediment, Color, Odor, etc.	none	→										none

Volume of Sediment from Last One Liter of Development Water: 0

Description of Containers and Containing Area for Water Removed During Pumping: NA Container Size: NA # of Containers: NA

Volume of Any Added Water: NA Source of Any Added Water: NA For Added Water: Temp pH Conductivity Turbidity NA

Figure 4-4
Well Development Form
Middletown Airfield Site

Project: HIA - Middletown | Site Name: HIA | Location: ERM-17I

Date: 9-7-94 | Form Completed by: WARREN FOR Matt VanVeidt | Job Title: Project Geologist

Total Depth of Well: | Elevation of Base of Well: Not Surveyed

Initial Water Level (Static) | Date Measured: 9-7-94 | Time:

Water Level Immediately Following Development 20.92 | Date Measured: 9-7-94 | Time: 1203

Water Level Afer Development (Static) 20.63' | Date Measured: 9-8-94 | Time: 1430

Method of Development:

	Type	Size	Make
Bailer	PSC	1½"	
Pump	Centrifugal	—	Tsurumi

Total Development Time: | Total Volume of Water Removed: ≅ 120 Gallons | Average Pumping Rate: 2.5 g/min

	Before Pumping		During Pumping			After Pumping	
Date and Time 9-7-94	0945	1110	1122	1128	1134	1140	1149
Volume of Water Removed (Gallons)	2	13	30	16	18	14	13
Description of Water (Clarity, Particulates, Odor)	Brown						
pH	6.5	6.7	6.6	6.5	6.6	6.5	6.5
Conductivity umhos	300	395	310	300	295	295	300
Turbidity NTU	126.5	+200	70.5	18.5	30.4	25.3	5.7
Temperature °C	19	19	17	16	15.5	15.5	16
Characteristeics of Sediment, Color, Odor, etc.	—	—	—	—	—	—	—

Volume of Sediment from Last One Liter of Development Water:

Description of Containers and Containing Area for Water Removed During Pumping: Steel Drums | Container Size: 55 Gallon | # of Containers: 3

Volume of Any Added Water: None | Source of Any Added Water: — | For Added Water: Temp, pH, Conductivity, Turbidity —

Figure 4-4
Well Development Form
Middletown Airfield Site

Project: USACE Site Name: HIA Location: ERM 18-5

Date: 7-1-94 Form Completed by: Brian Backenstose Job Title: Field Tech

Total Depth of Well: 19.85 Elevation of Base of Well: Not Surveyed

Initial Water Level (Static)	15.1	Date Measured:	7-1-94	Time: 0830
Water Level Immediately Following Development	15.21	Date Measured:	7-1-94	Time: 1100
Water Level Afer Development (Static)		Date Measured:		Time

Method of Development:	Type	Size	Make
Bailer			
Pump	Jet Sub.		Hydrogroup Grundfos

Total Development Time: 2 1/2 hrs. Total Volume of Water Removed: 65 gal Average Pumping Rate: ~.31 gal/min

	Before Pumping				During Pumping				After Pumping			
Date and Time	7-1-94 0830				1035	1040	1045	1055	1100			
Volume of Water Removed	0				20	10	10	10				
Description of Water (Clarity, Particulates, Odor)	very brown							clear	clear			
pH	6.2				5.2	5.2	5.3	5.2	5.3			
Conductivity	255				259	270	288	289	280			
Turbidity	0.71				off gauge	off gauge	88.3	12.2	11.9			
Temperature	18°				16°	16°	16°	16°	16°			
Characteristeics of Sediment, Color, Odor, etc.	none →											

Volume of Sediment from Last One Liter of Development Water:

Description of Containers and Containing Area for Water Removed During Pumping: NA Container Size: NA # of Containers: NA

Volume of Any Added Water: NA Source of Any Added Water: NA For Added Water: Temp, pH, Conductivity, Turbidity: NA

Figure 4-4
Well Development Form
Middletown Airfield Site

Project: USACE Site Name: HIA Location: ERM-18I

Date: 4-24-95 Form Completed by: Scott Lane Job Title: Env. Field Tech.

Total Depth of Well: 119.38 Elevation of Base of Well: Not Surveyed

Initial Water Level (Static) 16.66' Date Measured: 4-11-95 Time: 14:17
Water Level Immediately Following Development 16.50' Date Measured: 4-12-95 Time: 8:25
Water Level Afer Development (Static) 17.02' Date Measured: 4-12-95 Time: 9:58

Method of Development:

	Type	Size	Make
Bailer	S.S.	10'x1½	Hydrogroup
Pump	Jet Sub.		Grundfos

Total Development Time: Total Volume of Water Removed: 30gals bail Average Pumping Rate:

	Before Pumping				During Pumping				After Pumping			
Date and Time 4-12-95	9:00	9:06	9:14	9:20	9:25	9:30	9:35	9:40				
Volume of Water Removed	4gal.	24gal	56gal.	80gal.	100gal.	120gal.	~~140gal~~ 136gal	160gal				
Description of Water (Clarity, Particulates, Odor)	Slightly cloudy	clear	→				→	clear				
pH	7.5	7.4	7.5	7.4	7.4	7.5	7.4	7.4				
Conductivity	490	600	600	500	500	500	500	500				
Turbidity	17.04	5.50	2.43	1.88	2.10	2.03	1.56	1.99				
Temperature	12°C	13°C	13°C	13°C	13°C	13°C	13°C	13°C				
Characteristeics of Sediment, Color, Odor, etc.	none	→					→	none				

Volume of Sediment from Last One Liter of Development Water: 0

Description of Containers and Containing Area for Water Removed During Pumping: NA Container Size: NA # of Containers: NA

Volume of Any Added Water: NA Source of Any Added Water: NA For Added Water: Temp, pH, Conductivity, Turbidity: NA

Figure 4-4
Well Development Form
Middletown Airfield Site

Project: USACE Site Name: HIA Location: 195

Date: 7-1-94 Form Completed by: Brian Backenstose Job Title: Field Tech

Total Depth of Well: 18.45 Elevation of Base of Well: Not Surveyed

Initial Water Level (Static): 11.76 Date Measured: 7-1-94 Time: 1145

Water Level Immediately Following Development: 11.80 Date Measured: 7-1-94 Time: 1405

Water Level Afer Development (Static) Date Measured: Time

Method of Development: Bailer / Pump Type: Jet Sub. Size: Make: Hydrogroup Grundfos

Total Development Time: 2hrs 20min Total Volume of Water Removed: ~70 gal Average Pumping Rate: ~35 gal/min

	Before Pumping				During Pumping				After Pumping			
Date and Time	7-1-94 1145				1345	1350	1355	1408	1405			
Volume of Water Removed	0											
Description of Water (Clarity, Particulates, Odor)						slight sheen →			clear			
pH	6.3				4.6	4.5	4.8	4.9				
Conductivity	1.27				370	325	348	370				
Turbidity	218				off scale	off scale	120.1	30				
Temperature	17°				16°	16°	15°	16°				
Characteristeics of Sediment, Color, Odor, etc.	none					>						

Volume of Sediment from Last One Liter of Development Water:

Description of Containers and Containing Area for Water Removed During Pumping: NA Container Size: NA # of Containers: NA

Volume of Any Added Water: NA Source of Any Added Water: NA For Added Water: Temp, pH, Conductivity, Turbidity: NA

Figure 4-4
Well Development Form
Middletown Airfield Site

Project: USACE Site Name: HIA Location: ERM-205

Date: 6-30-94 Form Completed by: Brian Backenstos Job Title: Field Tech

Total Depth of Well: 25.45 Elevation of Base of Well: Not Surveyed

Initial Water Level (Static)	17.85	Date Measured:	6-30-94	Time: 1450
Water Level Immediately Following Development	17.74	Date Measured:	6-30-94	Time: 1800
Water Level Afer Development (Static)		Date Measured:		Time

Method of Development:	Type	Size	Make
Bailer			
Pump	Jet Sub.		Hydrogroup Grundfos

Total Development Time: 3 hrs Total Volume of Water Removed: 110 gal Average Pumping Rate: ~.46 gal/min

	Before Pumping				During Pumping				After Pumping			
Date and Time 6-30-94	1450			1520	1550	1620	1650	1720	1735	1755		
Volume of Water Removed	0											
Description of Water (Clarity, Particulates, Odor)	brown/cloudy	→										
pH	9.4			9.2	9.0	9.4	8.8	8.3	8.4	8.5		
Conductivity	1550			1500	1500	1500	1550	1500	1500	1500		
Turbidity	17.2			21	19	22	21	20	15.8	14.9		
Temperature	18°			16°	16°	18°	16°	15°	15°	15°		
Characteristeics of Sediment, Color, Odor, etc.	none	→										

Volume of Sediment from Last One Liter of Development Water:

Description of Containers and Containing Area for Water Removed During Pumping: NA Container Size: NA # of Containers: NA

Volume of Any Added Water: NA Source of Any Added Water: NA For Added Water: NA
Temp
pH
Conductivity
Turbidity

Figure 4-4
Well Development Form
Middletown Airfield Site

Project: USACE Site Name: HIA Location: ERM-20I

Date: 4-25-95 Form Completed by: Scott Lane Job Title: Env. Field Tech.

Total Depth of Well: 119.66' Elevation of Base of Well: Not Surveyed

Initial Water Level (Static) 17.39' Date Measured: 4-25-95 Time: 09:20

Water Level Immediately Following Development 17.36' Date Measured: 4-25-95 Time: 12'41

Water Level Afer Development (Static) 17.39' Date Measured: 4-25-95 Time 13:44

Method of Development:	Type	Size	Make
Bailer	S.S.	10'x 3"	Hydrogroup
Pump	Jet Sub.		Grundfos

Total Development Time: Surged and bailed 2 Hrs. pumped 44 min. Total Volume of Water Removed: bailed 13 gal. pumped 130 gals Average Pumping Rate. 3 gpm

	Before Pumping				During Pumping				After Pumping
Date and Time 4-25-95	13:00	1308	1313	1319	13:25	13:31	13:37	1343	
Volume of Water Removed	1st gal.	24 gal.	39 gal.	45 gal.	63 gal.	81 gal.	109 gal.	127 gal.	
Description of Water (Clarity, Particulates, Odor)	Cloudy brown	clear	→					clear	
pH	7.4	7.2	7.2	7.2	7.2	7.2	7.3	7.3	
Conductivity	900	800	800	750	750	700	700	700	
Turbidity	121.6	5.60	3.55	2.30	2.29	2.17	2.11	2.21	
Temperature	15°C	14°C	14°C	14°C	14°C	14°C	14°C	14°C	
Characteristeics of Sediment, Color, Odor, etc.	none	→						none	

Volume of Sediment from Last One Liter of Development Water: 0

Description of Containers and Containing Area for Water Removed During Pumping: NA Container Size: NA # of Containers: NA

Volume of Any Added Water: NA Source of Any Added Water: NA For Added Water: NA
Temp
pH
Conductivity
Turbidity

Figure 4-4
Well Development Form
Middletown Airfield Site

Project: USACE Site Name: HIA Location: ERM-21S

Date: 4-5-95 Form Completed by: Scott Lane Job Title: Env. Field Tech.

Total Depth of Well: 34.80' Elevation of Base of Well: Not Surveyed

Initial Water Level (Static) 18.32' Date Measured: 4-4-95 Time 13:23
Water Level Immediately Following Development 18.41' Date Measured: 4-5-95 Time 09:42
Water Level Afer Development (Static) 18.56' Date Measured: 4-5-95 Time 12:12

Method of Development:

	Type	Size	Make
Bailer	S.S.	10' x 1 1/2"	Hydrogroup
Pump	Jet Sub.		Grundfos

Total Development Time: 2 hrs and 30 min. Surged and bailed pumped for 1 hr. 55 mins. Total Volume of Water Removed: approx. 40 gal. bailed pumped 105 gal. Average Pumping Rate: 1 gpm

	Before Pumping				During Pumping				After Pumping			
Date and Time 4-5-95	1018	1035	1055	1103	11:11	11:19	11:25	1131	1139	11:42	11:48	11:51
Volume of Water Removed	1st gal.	18 gal.	48 gal.	56 gal.	64 gal.	72 gal.	78 gal	84 gal.	92 gal	95 gal.	101 gal.	104 gal
Description of Water (Clarity, Particulates, Odor)	cloudy dark reddish brown	cloudy brown	clear	clear	clear	clear	clear	clear	clear	clear	clear	clear
pH	7.5	7.3	7.4	7.3	7.3	7.3	7.3	7.4	7.4	7.3	7.3	7.3
Conductivity	900	900	900	900	1000	900	900	900	900	900	900	900
Turbidity	off scale	51.0	11.92	9.44	6.09	6.20	4.40	3.62	4.15	3.39	3.61	3.36
Temperature	13°C	14°C	14°C	15°C	15°C	15°C	14°C	15°C	15°C	15°C	15°C	15°C
Characteristeics of Sediment, Color, Odor, etc.	none	→									→	none

Volume of Sediment from Last One Liter of Development Water: 0

Description of Containers and Containing Area for Water Removed During Pumping: NA Container Size: NA # of Containers: NA

Volume of Any Added Water: NA Source of Any Added Water: NA For Added Water: Temp, pH, Conductivity, Turbidity: NA

Figure 4-4
Well Development Form
Middletown Airfield Site

Project: USACE Site Name: HIA Location: ERM-21I

Date: 4/4/95 Form Completed by: Scott Lane Job Title: Env. Field. Tech.

Total Depth of Well: 198.99' Elevation of Base of Well: Not Surveyed

Initial Water Level (Static) 17.90' Date Measured: 4/4/95 ~~10:00~~ SL Time: 10:00

Water Level Immediately Following Development 17.82' Date Measured: 4/4/95 Time: 12:49

Water Level Afer Development (Static) 17.94' Date Measured: 4/4/95 Time: 15:37

Method of Development:

	Type	Size	Make
Bailer	~~10'x3"~~ SS. (SL)	10'x3"	Hydrogroup
Pump	Jet Sub.	2 7/8"	Grundfos

Total Development Time: surged/bailed 2hrs. pumped for 1hr. and 52 mins Total Volume of Water Removed: bailed 24gal. pumped 605gal. Average Pumping Rate: approx. 6 gpm.

	Before Pumping				During Pumping				After Pumping			
Date and Time 4-4-95	1336	13:46	13:56	14:00	14:06	14:27	1500	1518				
Volume of Water Removed	1st gal.	40gal.	80gal.	98gal.	138gal.	255gal.	458gal.	584gal.				
Description of Water (Clarity, Particulates, Odor)	Slightly cloudy	slightly cloudy	slightly cloudy	clear	clear	clear	clear	clear				
pH	7.9	7.7	7.6	7.6	7.7	7.7	7.7	7.7				
Conductivity	440	400	380	380	380	370	370	370				
Turbidity	62.8	60.2	30.0	7.05	5.28	3.86	3.35	3.25				
Temperature	15°C	14°C	14°C	14°C	14°C	14°C	14°C	14°C				
Characteristeics of Sediment, Color, Odor, etc.	none											none

Volume of Sediment from Last One Liter of Development Water: 0

Description of Containers and Containing Area for Water Removed During Pumping: NA Container Size: NA # of Containers: NA

Volume of Any Added Water: NA Source of Any Added Water: NA For Added Water: Temp, pH, Conductivity, Turbidity: NA

Figure 4-4
Well Development Form
Middletown Airfield Site

Project: USACE Site Name: HIA Location: ERM-21D

Date: 4-5-95 Form Completed by: Scott Lane Job Title: Env. Field. Tech.

Total Depth of Well: 598.86' Elevation of Base of Well: Not Surveyed

Initial Water Level (Static) 24.27' Date Measured: 4-5-95 Time: 0840
Water Level Immediately Following Development 23.96' Date Measured: 4-5-95 Time: 12:16
Water Level Afer Development (Static) 20.54' Date Measured: 4-6-95 Time: 08:15

Method of Development:	Type	Size	Make
Bailer	S.S.	10' x 3"	Hydrogroup
Pump	Jet Sub.		Grundfos

Total Development Time: bailed and surged 2hrs. pumped 1hr. +45min. Total Volume of Water Removed: bailed 38gals pumped 984 gal. Average Pumping Rate: 10gpm

	Before Pumping				During Pumping				After Pumping			
Date and Time 4-5-95	1600	1608	1620	1625	16:31	16:36	17:11	1718	1728	17:33	17:38	17:45
Volume of Water Removed	1st gal	48 gal.	141 gal.	186 gal	244 gal	294 gal.	644 gal	714 gal	814 gal.	864 gal.	914 gal.	984 gal
Description of Water (Clarity, Particulates, Odor)	cloudy brown	cloudy brown	cloudy brown	cloudy brown	cloudy brown	cloudy brown (dark)	clear	clear	clear	clear	clear	clear
pH	8.5	8.3	8.1	8.1	8.1	8.1	8.0	8.0	8.0	8.0	8.0	8.0
Conductivity	700	700	700	700	700	700	600	600	600	600	600	600
Turbidity	41.8	62.5	64.3	48.7	57.4	109.6	14.59	10.64	7.92	8.81	6.84	6.70
Temperature	15°c	15°c	15°c	15°c	15°c	15°c	14°c	14°c	14°c	14°c	14°c	14°c
Characteristeics of Sediment, Color, Odor, etc.	none	→									→	none

Volume of Sediment from Last One Liter of Development Water: 0

Description of Containers and Containing Area for Water Removed During Pumping: NA Container Size: NA # of Containers: NA

Volume of Any Added Water: NA Source of Any Added Water: NA For Added Water: Temp, pH, Conductivity, Turbidity: NA

Figure 4-4
Well Development Form
Middletown Airfield Site

Project: USACE Site Name: HIA Location: ERM-22S

Date: 3/21/95 Form Completed by: Scott Lane Job Title: Env. Field. Tech.

Total Depth of Well: 42.83' Elevation of Base of Well: Not Surveyed

Initial Water Level (Static) 22.44' Date Measured: 3/21/95 Time:

Water Level Immediately Following Development 22.44 Date Measured: 3/21/95 Time: 08:54

Water Level Afer Development (Static) 24.46' Date Measured: 3/21/95 Time: 10:32

Method of Development:

	Type	Size	Make
Bailer	SS	3'x1 2/8"	Hydrogroup
Pump	Jet Sub.		Grundfos

Total Development Time: Surged/Bailed 2.5 hrs. pumped 1 hrs. & 10 min. Total Volume of Water Removed: Bailed 35 gal. (approx) pumped 355 gal. Average Pumping Rate: 5 gal./min.

	Before Pumping				During Pumping				After Pumping			
Date and Time 3/21/95	09:15	09:26	09:35	09:45	09:55	10:05	10:10	10:15	10:18	10:20	10:23	10:25
Volume of Water Removed	1st gal.	50 gal.	100 gal.	150 gal.	200 gal.	250 gal	275 gal.	300 gal.	315 gal.	325 gal.	340 gal	350 gal
Description of Water (Clarity, Particulates, Odor)	dark cloudy brown	cloudy brown	slightly cloudy	slightly cloudy	clear	clear	clear	clear	clear	clear	clear	clear
pH	6.2	6.5	6.5	6.6	6.7	6.7	6.7	6.7	6.7	6.7	6.7	6.7
Conductivity	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000
Turbidity	too dark to read	112.8	41.3	40.1	21.4	12.2	13.7	12.7	8.8	9.7	10.1	9.8
Temperature	15°C	15°C	15°C	15°C	15°C	15°C	15°C	15°C	15°C	15°C	15°C	15°C
Characteristeics of Sediment, Color, Odor, etc.	none	→									→	none

Volume of Sediment from Last One Liter of Development Water: 0

Description of Containers and Containing Area for Water Removed During Pumping: NA Container Size: NA # of Containers: NA

Volume of Any Added Water: NA Source of Any Added Water: NA For Added Water: Temp, pH, Conductivity, Turbidity NA

Figure 4-4
Well Development Form
Middletown Airfield Site

Project: USACE Site Name: HIA Location: ERM-22I

Date: 3/27/95 Form Completed by: Scott Lane Job Title: Env. Field. Tech.

Total Depth of Well: 198.62' Elevation of Base of Well: Not Surveyed

Initial Water Level (Static) 23.70' Date Measured: 3/27/95 Time: 13:28
Water Level Immediately Following Development 24.31' Date Measured: 3/27/95 Time: 16:50
Water Level Afer Development (Static) 38.62' Date Measured: 3/27/95 Time: 19:13

Method of Development:	Type	Size	Make
Bailer	S.S.	10'x 3"	Hydrogroup
Pump	Jet Sub.	2 7/8"	Grundfos

Total Development Time: surged/bailed 2hrs 4 10min. pumped 1hr. 51min. Total Volume of Water Removed: approx. 45gal. bailed 381 gal. pumped Average Pumping Rate: 5gal./permin

	Before Pumping				During Pumping				After Pumping			
Date and Time 3/27/95	1739	1753	1800	1806	1816	1823	1830	1835	1840	1845	1855	1900
Volume of Water Removed	1st gal	36 gal.	81 gal.	111gal	161gal.	196 gal.	231gal	256gal	281 gal	306 gal.	356gal.	381 gal
Description of Water (Clarity, Particulates, Odor)	cloudy brown	cloudy brown	cloudy brown	slightly cloudy	slightly cloudy	clear	clear	clear	clear	clear	clear	clear
pH	7.9	7.9	7.9	7.9	7.8	7.8	7.8	7.8	7.8	7.9	7.9	7.9
Conductivity	800	800	900	900	1000	1000	1000	1000	1000	1000	1000	1000
Turbidity	off (high) scale	off (high) scale	off (high) scale	39.4	20.8	13.62	10.64	8.81	8.12	7.03	5.05	5.01
Temperature	15°c	15°c	15°c	15°c	15°c	14°c	14°c	14°c	14°c	14°c	14°c	14°c
Characteristeics of Sediment, Color, Odor, etc.	none											none

Volume of Sediment from Last One Liter of Development Water: 0

Description of Containers and Containing Area for Water Removed During Pumping: NA Container Size: NA # of Containers: NA

Volume of Any Added Water: NA Source of Any Added Water: NA For Added Water: Temp, pH, Conductivity, Turbidity NA

Figure 4-4
Well Development Form
Middletown Airfield Site

Project: USACE Site Name: HIA Location: ERM-22D

Date: 3/27/95 Form Completed by: Scott Lane Job Title: Env. Field. Tech.

Total Depth of Well: Elevation of Base of Well: Not Surveyed

Initial Water Level (Static) 22.47' Date Measured: 3/27/95 Time: 0745

Water Level Immediately Following Development 22.50' Date Measured: 3/27/95 Time: 0952

Water Level Afer Development (Static) 22.44' Date Measured: 3/27/95 Time: 1500

Method of Development:	Type	Size	Make
Bailer	S.S.	10' x 3"	Hydrogroup
Pump	Jet Sub.	2 7/8"	Grundfos

Total Development Time: 2 hrs surged/bailed pumped 1 hr. and 30 min. Total Volume of Water Removed: bailed approx 50gal 816 gals pumped Average Pumping Rate: 6gpm

	Before Pumping				During Pumping				After Pumping			
Date and Time 3/27/95	12:12	12:20	12:26	12:38	1247	12:58	13:08	13:18	1328	1338		
Volume of Water Removed	1st gal	48 gal.	92 gal.	200gal	286gal.	396gal.	496gal.	596gal	696gal	796gal.		
Description of Water (Clarity, Particulates, Odor)	clear	clear	clear	clear	cloudy brown	clear	clear	clear	clear	clear		
pH	7.0	6.8	7.0	7.1	7.2	7.3	7.3	7.3	7.4	7.4		
Conductivity	1100	1100	1100	1200	1000	1100	1100	1200	1200	1200		
Turbidity	14.36	12.92	11.63	9.53	57.4	12.05	4.38	4.34	4.15	3.45		
Temperature	19°C	15°C	15°C	15°C	15°C	15°C	15°C	15°C	15°C	15°C		
Characteristeics of Sediment, Color, Odor, etc.	none	→										none

Volume of Sediment from Last One Liter of Development Water: 0

Description of Containers and Containing Area for Water Removed During Pumping: NA Container Size: NA # of Containers: NA

Volume of Any Added Water: NA Source of Any Added Water: NA For Added Water: NA
Temp
pH
Conductivity
Turbidity

Figure 4-4
Well Development Form
Middletown Airfield Site

Project: USACE Site Name: HIA Location: ERM-23S

Date: 3/15/95 Form Completed by: Scott Lane Job Title: Env. Field. Tech.

Total Depth of Well: 23.44' Elevation of Base of Well: Not Surveyed

Initial Water Level (Static) 14.45' Date Measured: 3/15/95 Time: 08:15
Water Level Immediately Following Development ~~12.96'~~ SL 14.48' Date Measured: 3/15/95 Time: 09:54
Water Level Afer Development (Static) 14.42' Date Measured: 3/15/95 Time: 17:56

Method of Development:	Type	Size	Make
Bailer	S.S.	10' x 3"	Hydrogroup
Pump	Jet Sub.	2 7/8"	Grundfos

Total Development Time: Total Volume of Water Removed: Average Pumping Rate:

	Before Pumping				During Pumping				After Pumping			
Date and Time 3/15/95	15:19	15:39	1554	1612	1627	1645	1701	1716	1734	1746	1752	1754
Volume of Water Removed (gal)	1st gal	84 gal	174 gal	282	372	480	576	672	780	826	862	874
Description of Water (Clarity, Particulates, Odor)	cloudy brown	cloudy brown	cloudy brown	cloudy brown	slightly cloudy	slightly cloudy	clear	→	→	→	→	clear
pH	6.4	6.4	6.4	6.4	6.5	6.4	6.4	6.4	6.4	6.5	6.5	6.5
Conductivity (μmhos)	900	800	700	700	800	700	700	700	700	700	700	700
Turbidity (NTU)	too high to read	→	→	too high to read	66.5	49.6	36.2	28.8	23.6	17.9	17.6	18.1
Temperature	17°C	15°C	16°C	15°C	15°C	16°C	15°C	15°C	16°	15°C	15°C	16°C
Characteristeics of Sediment, Color, Odor, etc.	None	→	→	→	→	→	→	→	→	→	→	None

Volume of Sediment from Last One Liter of Development Water: 0

Description of Containers and Containing Area for Water Removed During Pumping: NA Container Size: NA # of Containers: NA

Volume of Any Added Water: NA Source of Any Added Water: NA For Added Water: Temp, pH, Conductivity, Turbidity: NA

Figure 4-4
Well Development Form
Middletown Airfield Site

Project: USACE | Site Name: H1A | Location: ERM-23I

Date: 3/9/95 | Form Completed by: Scott Lane | Job Title: Env. Field Tech.

Total Depth of Well: 194.41' | Elevation of Base of Well: Not Surveyed

Initial Water Level (Static) 26.05' | Date Measured: 3/9/95 | Time: 1020

Water Level Immediately Following Development 15.65' | Date Measured: | Time:

Water Level Afer Development (Static) | Date Measured: | Time:

Method of Development:	Type	Size	Make
Bailer	SS	10'x3"	Hydrogroup
Pump	jet sub.	2 7/8"	Grundfos

Total Development Time: 2hrs 3min. Surging and bailing purged w/ pump for 1 hr. 5min. | Total Volume of Water Removed: bailed approx. 60gal. pumped ~~405~~ 465gal. 465gal. | Average Pumping Rate: 9 ga./min.

	Before Pumping		During Pumping		After Pumping	
Date and Time 3/9/95	12:55	13:15	13:46	1351	1354	1358
Volume of Water Removed	1stgal.	120 gal.	339 gal.	384 gal.	411 gal.	447
Description of Water (Clarity, Particulates, Odor)	cloudy brown no oder	Clear no oder	→	→	→	Clear no oder
pH	7.6	7.4	7.2	7.3	7.3	7.3
Conductivity	600	600	500	500	600	500
Turbidity	30.1	6.8	8.1	9.2	9.5	9.2
Temperature	14°C	14°C	14°C	15°C	14°C	15°C
Characteristeics of Sediment, Color, Odor, etc.	no Sediment	no sediment	→	→	→	no Sediment

Volume of Sediment from Last One Liter of Development Water: 0

Description of Containers and Containing Area for Water Removed During Pumping: N/A | Container Size: N/A | # of Containers: N/A

Volume of Any Added Water: N/A | Source of Any Added Water: N/A | For Added Water: Temp, pH, Conductivity, Turbidity: N/A

Figure 4-4
Well Development Form
Middletown Airfield Site

Project: USACE Site Name: HIA Location: ERM-23D

Date: 3/8/95 Form Completed by: Job Title:

Total Depth of Well: 600.54' Elevation of Base of Well: No surveyed

Initial Water Level (Static) 32.15' Date Measured: 3/8/95 Time: 0918
Water Level Immediately Following Development Date Measured: Time:
Water Level Afer Development (Static) Date Measured: Time:

Method of Development:	Type	Size	Make
Bailer	SS	10'3"	Hydrogroup
Pump	jet sub.	2 7/8"	Grundfos

Total Development Time: Surged and bailed for two hrs. and 3 mins. pumped for 2hrs. 45mins. Total Volume of Water Removed: purged 1122 gal bailed 60 total 1182 gal Average Pumping Rate: 8 gal./min.

	Before Pumping		During Pumping		After Pumping	
Date and Time 3/8/95	1445	1512	1541	1610	1650	1720
Volume of Water Removed	1 gal.	120 gal.	288 gal.	482 gal	802 gal.	1042 gal.
Description of Water (Clarity, Particulates, Odor)	cloudy brown no odor	~~slightly~~ SL cloudy brown no odor	cloudy reddish SL brown brown, no odor	slightly cloudy brown, no odor	Clear no odor	Clear no odor
pH	7.7	7.5	7.5	7.6	7.6	7.6
Conductivity	700	700	700	600	600	600
Turbidity	31.8 NTU	33.4 NTU	84.0 NTU	26.1 NTU	12.43 NTU	4.43
Temperature	13°C	16°C	15°C	15°C	14°C	14.°C
Characteristeics of Sediment, Color, Odor, etc.	none →				→	NONE

Volume of Sediment from Last One Liter of Development Water:

Description of Containers and Containing Area for Water Removed During Pumping: Direct discharge to ground pavement Container Size: N/A # of Containers: N/A

Volume of Any Added Water: N/A Source of Any Added Water: N/A For Added Water: Temp N/A, pH, Conductivity, Turbidity

Figure 4-4
Well Development Form
Middletown Airfield Site

Project: USACE Site Name: HIA Location: ERM-24S

Date: 3/15/95 Form Completed by: Scott Lane Job Title: Env. Field. Tech.

Total Depth of Well: 23.45' Elevation of Base of Well: Not Surveyed

Initial Water Level (Static) 13.03' Date Measured: 3/14/95 Time: 17:07
Water Level Immediately Following Development 12.96' Date Measured: 3/15/95 Time: 09:54
Water Level Afer Development (Static) 13.06' Date Measured: 3/15/95 Time: 13:15

Method of Development:	Type	Size	Make
Bailer	S.S.	10'x1 2/8"	Hydrogroup
Pump	Jet Sub.		Grundfos

Total Development Time: Bailed/Surged approx. 2hrs. and 15 mins pumped 1 hr. and 48 mins Total Volume of Water Removed: approx. 35 gal. bailed pumped 537 gal. Average Pumping Rate: approx. 5 gal./min.

	Before Pumping				During Pumping				After Pumping			
Date and Time 3/15/95	11:09	11:31	11:51	12:07	12:20	12:30	12:40	12:45	12:50	12:55	12:57	13:01
Volume of Water Removed (gal)	1st. gal	92	192	272	337	387	437	487	512	537	587 547	557
Description of Water (Clarity, Particulates, Odor)	cloudy brown	Cloudy brown	Slightly Cloudy	Clear	Clear	clear	clear	clear	clear	clear	clear	clear
pH	6.5	6.0	6.1	6.1	6.2	6.3	6.4	6.3	6.4	6.4	6.4	6.4
Conductivity (µmhos)	800	600	800	700	700	700	700	700	700	700	700	700
Turbidity (Ntu)	Too high to take reading	178.9	62.8	23.5	15.8	12.2	13.1	13.3	12.7	11.7	10.9	10.8
Temperature	16°C	→									→	16°C
Characteristeics of Sediment, Color, Odor, etc.	No sed.	→									→	No sed.

Volume of Sediment from Last One Liter of Development Water:

Description of Containers and Containing Area for Water Removed During Pumping: NA Container Size: NA # of Containers: NA

Volume of Any Added Water: NA Source of Any Added Water: NA For Added Water: NA
Temp
pH
Conductivity
Turbidity

Figure 4-4
Well Development Form
Middletown Airfield Site

Project: USACE, Middletown Site Name: HIA Location: ERM-24I

Date: 3/10/95 Form Completed by: Scott Lane Job Title: Env. Field Tech.

Total Depth of Well: 199.04' Elevation of Base of Well: Not Surveyed

Initial Water Level (Static) 14.26' Date Measured: 3/10/95 Time: 08:00

Water Level Immediately Following Development Date Measured: Time:

Water Level Afer Development (Static) 57.32' Date Measured: 3/10/95 Time: 11:40

Method of Development:	Type	Size	Make
Bailer	SS	10'x 3"	Hydrogroup
Pump	jet sub.	2 7/8"	Grundfos

Total Development Time: 2hrs surged and bailed pumped for 1hr. 32min. Total Volume of Water Removed: approx. 60 gal. bailed 552gal purged Average Pumping Rate: 6 gal./min.

	Before Pumping		During Pumping		After Pumping	
Date and Time 3/10/95	08:53	0910	0930	10:10	10:20	10:25
Volume of Water Removed	1st. gal.	102 gal.	222gal.		522 gal	552gal
Description of Water (Clarity, Particulates, Odor)	dark gray in color, bad Sulfur oder	lighter gray in color Sulfur oder	Clear Slight sulfur oder	none Slight sulfur	Slight Sulfur oder	Slight sulfur oder
pH	7.7	7.5	7.6	7.7	7.6	7.6
Conductivity	600	800	800	800	800	800
Turbidity	85.7	10.9	7.0	3.6	4.2	~~7.6~~ 4.5 SC
Temperature	14°C	16°C	15°C	16°C	16°C	16°C
Characteristeics of Sediment, Color, Odor, etc.	black gravel Sulfur oder	black gravel sulfur oder	none	→	→	none

Volume of Sediment from Last One Liter of Development Water:

Description of Containers and Containing Area for Water Removed During Pumping: NA Container Size: NA # of Containers: NA

Volume of Any Added Water: NA Source of Any Added Water: NA For Added Water: Temp, pH, Conductivity, Turbidity: NA

Figure 4-4
Well Development Form
Middletown Airfield Site

Project: USACE Site Name: HIA Location: ERM-24D

Date: 3/23/95 Form Completed by: Scott Lane Job Title: Env. Field. Tech.

Total Depth of Well: 598.79' Elevation of Base of Well: Not Surveyed

Initial Water Level (Static) Date Measured: Time:

Water Level Immediately Following Development: 29.46' Date Measured: 3/23/95 Time: 11:05

Water Level Afer Development (Static): 28.98' Date Measured: 3/23/95 Time: 16:50

Method of Development:

	Type	Size	Make
Bailer	SS	10'x3"	Hydrogroup
Pump	Jet Sub.	2 7/8"	Grundfos

Total Development Time: surged and bailed for 2hrs. pumped approx 3hrs Total Volume of Water Removed: bailed approx. 30gal. 858gal. pumped Average Pumping Rate: 6gal./min.

	Before Pumping				During Pumping				After Pumping			
Date and Time 3/23/95	12:20	12:34	12:59	1343	14:01	1423	1433	1441	1451	1502	1512	1522
Volume of Water Removed	1st gal	84gal.	234gal	386gal	406gal	504gal	564gal.	612gal.	672gal	738gal.	798gal.	858gal
Description of Water (Clarity, Particulates, Odor)	cloudy brown	slightly cloudy	slightly cloudy	slightly cloudy	slightly cloudy	clear	clear	clear	clear	clear	clear	clear
pH	6.9	6.6	6.8	7.0	7.0	7.0	7.1	7.0	7.0	7.1	7.1	7.0
Conductivity	600	600	600	700	700	700	700	700	700	700	700	700
Turbidity	68.1	48.4	43.2	42.5	42.0	30.6	13.53	9.96	6.52	6.14		5.60
Temperature	15°c	16°c	16°c	16°c	16°c	16°c	16°c	16°c	16°c	16°c	16°c	16°c
Characteristeics of Sediment, Color, Odor, etc.	none	→									→	none

Volume of Sediment from Last One Liter of Development Water: 0

Description of Containers and Containing Area for Water Removed During Pumping: NA Container Size: NA # of Containers: NA

Volume of Any Added Water: NA Source of Any Added Water: NA For Added Water: NA
Temp
pH
Conductivity
Turbidity

* Surged and bailed on 4-3-95. Didn't make enough water to allow the use of a pump to purge water out of it. The water that was bailed was too silty to stick a pump in (the well).

Figure 4-4
Well Development Form
Middletown Airfield Site

Project: USACE Site Name: HIA Location: ERM-25S

Date: 4-3-95 PM / 4/4/95 AM Form Completed by: Scott Lane Job Title: Env. Field. Tech.

Total Depth of Well: 45.19' (WE) Elevation of Base of Well: Not Surveyed

Initial Water Level (Static) 36.13' Date Measured: 4-3-95 Time: 15:50

Water Level Immediately Following Development 44.69' (after bailing) Date Measured: 4-3-95 Time: 17:54

Water Level Afer Development (Static) Date Measured: Time:

Method of Development:

	Type	Size	Make
Bailer	S.S.	10' x 1½"	Hydrogroup
Pump	Jet Sub.		Grundfos

Total Development Time: 4 hours Total Volume of Water Removed: ≤ 20 gallons do 25 Average Pumping Rate: Hand bailed

	Before Pumping	During Pumping	After Pumping
Date and Time			
Volume of Water Removed	Parameters were not taken		
Description of Water (Clarity, Particulates, Odor)	due do poor recharge rate.		
pH			
Conductivity	Hand bailed ≤ 25 (WE) gallons from 25' well - Bailed well dry (2 days)		
Turbidity			
Temperature			
Characteristeics of Sediment, Color, Odor, etc.		(WE)	4-3-95

Volume of Sediment from Last One Liter of Development Water:

Description of Containers and Containing Area for Water Removed During Pumping: NA Container Size: NA # of Containers: NA

Volume of Any Added Water: NA Source of Any Added Water: NA For Added Water: NA
Temp
pH
Conductivity
Turbidity

Figure 4-4
Well Development Form
Middletown Airfield Site

Project: USACE Site Name: HIA Location: ERM-25I

Date: 3/17/95. Form Completed by: Scott Lane Job Title: Env. Field. Tech.

Total Depth of Well: Elevation of Base of Well: Not Surveyed

Initial Water Level (Static) 40.68' Date Measured: 3/16/95 Time: 14:55

Water Level Immediately Following Development 41.16' Date Measured: ~~1700~~ 3/16/95 Time: 1700

Water Level Afer Development (Static) 41.05' Date Measured: 3/17/95 Time: 1204

Method of Development:	Type	Size	Make
Bailer	S.S.	10' x 1⅜"	Hydrogroup
Pump	Jet Sub.	approx 1½"	Grundfos

Total Development Time: surged/bailed 2hrs. pumped 1 hr. Total Volume of Water Removed: approx. 50gal. bailed 672 gal. pumped Average Pumping Rate: 6 gal./min.

	Before Pumping				During Pumping				After Pumping			
Date and Time 3/17/95	0812	0822	0842	0912	1103	1115	1131	1144	1153	1155	1159	1202
Volume of Water Removed (gal)	25gal	80gal	157gal	241	328	390	486	564	618	630	654	672
Description of Water (Clarity, Particulates, Odor)	clear	clear	clear	cloudy	slightly cloudy	clear	cloudy	slightly cloudy	clear	clear	clear	clear
pH	7.4	7.3	7.4	7.4	7.4	7.4	7.4	7.4	7.4	7.2	7.4	7.4
Conductivity (umhos)	500	500	400	410	410	400	420	420	410	410	410	410
Turbidity (NTU)	20.7	13.1	7.7	90.3	34.1	8.9	101.5	77.8	58.1	54.4	47.1	43.1
Temperature	17°c	14°c	14°c	14°c	15°c	15°c	15°c	14°c	14°c	14°c	14°c	14°c
Characteristeics of Sediment, Color, Odor, etc.	none	→										none

Volume of Sediment from Last One Liter of Development Water: 0

Description of Containers and Containing Area for Water Removed During Pumping: NA Container Size: NA # of Containers: NA

Volume of Any Added Water: NA Source of Any Added Water: NA For Added Water: Temp, pH, Conductivity, Turbidity: NA

* The water from this well contained tiny bubbles that made the water appear cloudy white. The water cleared in a few minutes as the bubbles dissolved or dispated. Turbidity didn't fully stabilize.

Figure 4-4
Well Development Form
Middletown Airfield Site

Project: USACE Site Name: HIA Location: ERM-25D

Date: 4-25-95 Form Completed by: Scott Lane Job Title: Env. Field Tech.

Total Depth of Well: 599.27' Elevation of Base of Well: Not Surveyed

Initial Water Level (Static) 36.44' Date Measured: 4-24-95 Time: 08:40
Water Level Immediately Following Development 36.16' Date Measured: 4-24-95 Time: 14:15
Water Level Afer Development (Static) 45.09' Date Measured: 4-24-95 Time 16:54

Method of Development:

	Type	Size	Make
Bailer	S.S.	10' x 3"	Hydrogroup
Pump	Jet Sub.		Grundfos

Total Development Time: Surged/bailed 2hrs. pumped 1hr and 9 min. Total Volume of Water Removed: bailed approx. 35gal. pumped 449 gal. Average Pumping Rate. 3.5gpm

	Before Pumping				During Pumping				After Pumping			
Date and Time 4-24-95	14:38	14:59	15:09	15:19	15:28	15:46	16:00	16:14	16:25	1633	16:38	16:46
Volume of Water Removed	1st. gal.	58 gal.	88 gal.	118gal.	148gal.	202gal.	244gal.	286gal.	329gal.	361gal.	381gal.	441gal.
Description of Water (Clarity, Particulates, Odor)	cloudy *	slightly cloudy *	→								→	slightly cloudy *
pH	8.4	8.4	8.4	8.2	8.2	8.3	8.3	8.3	8.3	8.4	8.4	8.3
Conductivity	600	600	600	600	600	600	600	600	550	550	550	550
Turbidity	28.3	16.33	~~13.71~~ (SL) 15.09	13.71	14.42	11.84	10.06	10.02	10.61	10.18	10.57	13.01
Temperature	15°c	15°c	15°c	15°c	15°c	15°c	15°c	15°c	15°c	15°c	15°c	15°c
Characteristeics of Sediment, Color, Odor, etc.	none	→									→	none

Volume of Sediment from Last One Liter of Development Water:

Description of Containers and Containing Area for Water Removed During Pumping: NA Container Size: NA # of Containers: NA

Volume of Any Added Water: NA Source of Any Added Water: NA For Added Water: Temp, pH, Conductivity, Turbidity: NA

* well Not make enough water to pump properly.

Figure 4-4
Well Development Form
Middletown Airfield Site

Project: USACE Site Name: HIA Location: ERM-26S

Date: 4-25-95 Form Completed by: Scott Lane Job Title: Env. Field Tech.

Total Depth of Well: 45.61' Elevation of Base of Well: Not Surveyed

Initial Water Level (Static) 43.65' Date Measured: 3-14-95 Time: 07:45
Water Level Immediately Following Development 39.72' Date Measured: 4-12-95 Time: 11:35
Water Level Afer Development (Static) 39.88 Date Measured: 4-12-95 Time 13:10

Method of Development:

	Type	Size	Make
Bailer	PVC	36" x 1½"	~~Hydrogroup~~ (SL)
Pump	Jet Sub.		Grundfos

Total Development Time: surged and bailed 2 hrs pumped for 1 hrs. 1 hr. Total Volume of Water Removed: bailed approx. 6 gal. pumped 12 gal. Average Pumping Rate: approx. .75 gpm

	Before Pumping				During Pumping		After Pumping					
Date and Time	4-12-95 11:51	12:06	12:19	1231	1240	12 51						
Volume of Water Removed	1.5 gal	6.0 gal	8.5 gal.	9.5 gal.	10.5 gal.	11.5 gal.						
Description of Water (Clarity, Particulates, Odor)	cloudy dark reddish brown	→			→	cloudy dark reddish brown						
pH	6.9	7.0	7.0	7.0	6.9	6.9						
Conductivity	800	900	800	800	900	1000						
Turbidity	off scale	→			→	off scale						
Temperature	15°c	14°c	15°c	15°c	15°c	15°c						
Characteristeics of Sediment, Color, Odor, etc.	reddish brown silt	→		→	reddish brown silt	none						

Volume of Sediment from Last One Liter of Development Water: 0

Description of Containers and Containing Area for Water Removed During Pumping: NA Container Size: NA # of Containers: NA

Volume of Any Added Water: NA Source of Any Added Water: NA For Added Water: Temp, pH, Conductivity, Turbidity: NA

Figure 4-4
Well Development Form
Middletown Airfield Site

Project: USACE, Middletown Site Name: HIA Location: ERM-26I ~~(SENT)~~

Date: 3/7/95 Form Completed by: Scott Lane Job Title: Field tech.

Total Depth of Well: 200.96' Elevation of Base of Well: Not Surveyed

Initial Water Level (Static) 56.34 Date Measured: 3/7/95 Time: 1545

Water Level Immediately Following Development Date Measured: Time:

Water Level Afer Development (Static) Date Measured: Time:

Method of Development:	Type	Size	Make
Bailer	SS	10' x 3"	Hydrogroup
Pump	jet sub	2 1/8"	Grundfos

Total Development Time: 2 hrs. surged and bailed pump for 1hr. 10min Total Volume of Water Removed: bailed 62gal. pumped 315gal total 377gal. Average Pumping Rate: 5 gal./min.

	Before Pumping		During Pumping		After Pumping	
Date and Time 3/7/95	1455	1555	1504	1625	1640	1653
Volume of Water Removed	1st. gal.	25 gal.	55 gal	175 gal	250 gal	315 gal.
Description of Water (Clarity, Particulates, Odor)	slightly cloudy no odor	clear no odor	→	→	→	→
pH	7.8	7.9	7.7	7.8	7.8	7.6
Conductivity	400	400	400	400	400	400
Turbidity	meter malfuntion	→	→	→	→	→
Temperature	13°C	14°C	15°C	15°C	15°C	15°C
Characteristeics of Sediment, Color, Odor, etc.	O none	→	→	→	→	→

Volume of Sediment from Last One Liter of Development Water:

Description of Containers and Containing Area for Water Removed During Pumping: direct discharge into street Container Size: N/A # of Containers: N/A

Volume of Any Added Water: N/A Source of Any Added Water: N/A For Added Water: Temp, pH, Conductivity, Turbidity: N/A

Figure 4-4
Well Development Form
Middletown Airfield Site

Project: USACE, Middletown Site Name: HIA Location: ERM-26D

Date: 3/7/95 Form Completed by: Scott Lane Job Title: Env. Field Tech.

Total Depth of Well: 609.57' Elevation of Base of Well: N. Surveyed

Initial Water Level (Static) 38.70' Date Measured: 3/7/95 Time: 0815

Water Level Immediately Following Development Date Measured: Time:

Water Level Afer Development (Static) Date Measured: Time:

Method of Development:	Type	Size	Make
Bailer	SS	10'x3"	Hydrogroup
Pump	jet Sub	2 7/8"	Grundfos

Total Development Time: 2HRS Surge & Bail, 2HRS & 20mins. pumped Total Volume of Water Removed: 568 gal. Pumped + 42 gal bailed Average Pumping Rate: @ 4.75 gal./min.

	Before Pumping		During Pumping		After Pumping	
Date and Time 3/7/95	0820	0839	0925	1000	1030	1040
Volume of Water Removed	1 st gal	20 gal.	254 gal.	394 gal.	514 gal.	554 gal.
Description of Water (Clarity, Particulates, Odor)	turbid brownish yellow no odor	slightly turbid no odor	clear no odor	→	→	clear no odor
pH	7.9	7.7	7.9	7.9	7.9	7.9
Conductivity	400	400	400	300	300	300
Turbidity	91.4	15.2	9.55	3.00	4.94	2.12
Temperature	13.°C	13°C	14.°C	14°C	14°C	14°C
Characteristeics of Sediment, Color, Odor, etc.	no sed.	→			→	

Volume of Sediment from Last One Liter of Development Water: 0

Description of Containers and Containing Area for Water Removed During Pumping: Direct discharge into Street Container Size: N/A # of Containers: N/A

Volume of Any Added Water: N/A Source of Any Added Water: N/A For Added Water: Temp, pH, Conductivity, Turbidity: N/A

Figure 4-4
Well Development Form
Middletown Airfield Site

Project: HIA - Middletown Site Name: HIA Location: ERM-275

Date: 8-23-94 Form Completed by: WARREN FOX for - Matt VanVreda Job Title: Project Geologist

Total Depth of Well: (WL) ~~12.9~~ 22.85' Elevation of Base of Well: Not Surveyed

Initial Water Level (Static) 12.97' Date Measured: 8-23-94 Time: 0900

Water Level Immediately Following Development ~~12.92~~ (WL) 12.92' Date Measured: 8-23-94 Time: ~~1612~~ (WL) 1200

Water Level Afer Development (Static) 12.69' Date Measured: 8-24-94 Time: 1440

Method of Development:

	Type	Size	Make
Bailer	PVC	1½"	
Pump	(WL) Centrifugal	—	Tanaka

Total Development Time: 3hours Total Volume of Water Removed: 100 Gallons Average Pumping Rate: 1.45 G/min.

	Before Pumping (WL)			During Pumping			After Pumping
Date and Time 8-23-94	0910	1014	1040	1105	1115	1130	1145
Volume of Water Removed (Gallons)	1.0	23	14	26	20	15	20
Description of Water (Clarity, Particulates, Odor)	Dark Brown/ gray	→	→	Cloudier	→	→	Clear
pH	—	—	—	—	—	—	—
Conductivity umhos	650	600	600	550	600	600	600
Turbidity NTU	+200	+200	+200	166	63.1	187	20.1
Temperature °C	18	19	19.5	24	23	23	21
Characteristeics of Sediment, Color, Odor, etc.	—	—					

Volume of Sediment from Last One Liter of Development Water: None

Description of Containers and Containing Area for Water Removed During Pumping: Steel Drums Container Size: 55 Gallon # of Containers: 2

Volume of Any Added Water: None Source of Any Added Water: — For Added Water: Temp — pH Conductivity Turbidity

Figure 4-4
Well Development Form
Middletown Airfield Site

Project: HIA- Middletown | Site Name: HIA | Location: ERM-28S

Date: 8-24-94 | Form Completed by: WARREN FOX FOR MATT VanHeide | Job Title: Project Geologist

Total Depth of Well: 20.91 | Elevation of Base of Well: Not Surveyed

Initial Water Level (Static)	7.37'	Date Measured: 8-24-94	Time: 1230
Water Level Immediately Following Development	16.74'	Date Measured: 8-24-94	Time: 1636
Water Level Afer Development (Static)	6.69'	Date Measured: 8-25-94	Time: 1530

Method of Development:	Type	Size	Make
Bailer	PVC	1 1/2"	
Pump	Centrifugal	—	Tanaka

Total Development Time: | Total Volume of Water Removed: 94 Gallons | Average Pumping Rate: 0.5 gal/min

	Before Pumping		During Pumping				After Pumping
Date and Time 8-24-94	1235	1455	1502	1528 1528	1546 1546	1558 1546	1624
Volume of Water Removed (Gallons)	0	52	4	3	4	6	11
Description of Water (Clarity, Particulates, Odor)	Reddish brown	→	→	→	→	→	ORANGE BROWN
pH	7.1	6.5	6.5	6.4	6.4	6.45	6.5
Conductivity umHos	1000	1050	1050	1050	1050	1100	1100
Turbidity NTU	168.2	126.3	+200	67.9	84.0	114.4	162.8
Temperature °C	21	20.5	21.5	22	22	20	23
Characteristeics of Sediment, Color, Odor, etc.							

Volume of Sediment from Last One Liter of Development Water: Silty

Description of Containers and Containing Area for Water Removed During Pumping: Steel Drums | Container Size: 55 gallon | # of Containers: 2

Volume of Any Added Water: None | Source of Any Added Water: — | For Added Water: Temp —, pH, Conductivity, Turbidity

Figure 4-4
Well Development Form
Middletown Airfield Site

Project: USACE Site Name: HIA Location: ERM-29S

Date: 3-29-95 Form Completed by: Scott Lane Job Title: Env. Field. Tech.

Total Depth of Well: 45.23' Elevation of Base of Well: Not Surveyed

Initial Water Level (Static) 30.78' Date Measured: 3-29-95 Time: 11:05
Water Level Immediately Following Development 32.27' Date Measured: 3-29-95 Time: 14:05
Water Level Afer Development (Static) 33.02' Date Measured: 3-29-95 Time: 16:32

Method of Development:		Type	Size	Make
	Bailer	SS.	10'x1½"	Hydrogroup
	Pump	Jet Sub.		Grundfos

Total Development Time: surged/bailed 2hrs. pumped 1 hr and 40 mins Total Volume of Water Removed: bailed 15 gal. 57 gal. pumped Average Pumping Rate: >5 gpm

	Before Pumping				During Pumping				After Pumping			
Date and Time 3-29-95	1434	1448	1459	1510	1520	15:35	1545	1555	1600	1605	1610	16:15
Volume of Water Removed	1st gal	7.5 gal.	13.0 gal.	18.5 gal	23.0 gal	31. gal	41. gal	46 gal.	48.5 gal	51 gal.	53.5 gal	56. gal
Description of Water (Clarity, Particulates, Odor)	cloudy to brown	cloudy to brown	clear to slightly cloudy	slightly cloudy	clear	clear	→	→	→	→	→	clear
pH	6.9	5.5	5.5	5.5	5.4	5.4	5.4	5.3	5.3	5.3	5.4	5.4
Conductivity	280	270	260	260	250	250	250	260	260	260	260	250
Turbidity	off scale	140.6	34.5	32.2	23.0	16.04	16.12	12.36	10.62	10.63	9.68	10.56
Temperature	16°C	16°C	16°C	16°C	16°C	16°C	16°C	16°C	16°C	16°C	16°C	16°C
Characteristeics of Sediment, Color, Odor, etc.	none	→	→	→	→	→	→	→	→	→	→	none

Volume of Sediment from Last One Liter of Development Water: 0

Description of Containers and Containing Area for Water Removed During Pumping: NA Container Size: NA # of Containers: NA

Volume of Any Added Water: NA Source of Any Added Water: NA For Added Water: Temp, pH, Conductivity, Turbidity: NA

Figure 4-4
Well Development Form
Middletown Airfield Site

Project: USACE Site Name: HIA Location: ERM-29I

Date: 3/24/95 Form Completed by: Scott Lane Job Title: Env. Field. Tech.

Total Depth of Well: Elevation of Base of Well: Not Surveyed Page 113 and 114 log book

Initial Water Level (Static) Date Measured: Time:

Water Level Immediately Following Development 20.74' Date Measured: 3/24/95 Time: 0800

Water Level Afer Development (Static) 20.69' Date Measured: 3/24/95 Time: 1210

Method of Development:

	Type	Size	Make
Bailer	~~PVC~~ (SL) SS.	3' x 1 2/8	Hydrogroup
Pump	~~Jet Sub~~ (SL) USED Bailer (PVC)		~~Grundfos~~ SL.

Total Development Time: Surged/bailed 2hrs purged w/bailer 1 hr. 450 min. Total Volume of Water Removed: 30gal. bailed 90gal. purged Average Pumping Rate: approx. 1 gal/min.

	Before Pumping				During Pumping				After Pumping			
Date and Time 3/24/95	8:24	9:14	9:35	10:00	10 24	10 34	1048	1109	11:22	1135	11:50	12:07
Volume of Water Removed	1st gal	20gal.	30gal.	40g.	50gal.	55gal.	60gal.	70gal.	75gal.	80gal.	85gal.	90gal.
Description of Water (Clarity, Particulates, Odor)	slightly cloudy	slightly cloudy	clear	clear	clear	clear	clear	clear	clear	clear	clear	clear
pH	6.4	6.5	6.5	6.4	6.5	6.6	6.6	6.7	6.5	6.5	6.5	6.5
Conductivity	470	430	420	430	450	440	440	450	450	440	470	450
Turbidity	208	27.8	18.36	11.58	15.04	12.15	8.72	6.04	5.63	5.74	6.81	5.02
Temperature	15°c	14°c	14°c	14°c	14°c	14°c	14°c	14°c	14°c	14°c	14°c	14°c
Characteristeics of Sediment, Color, Odor, etc.	none											none

Volume of Sediment from Last One Liter of Development Water: 0

Description of Containers and Containing Area for Water Removed During Pumping: NA Container Size: NA # of Containers: NA

Volume of Any Added Water: NA Source of Any Added Water: NA For Added Water: Temp, pH, Conductivity, Turbidity: NA

Figure 4-4
Well Development Form
Middletown Airfield Site

Project: USACE Site Name: HIA Location: ERM-30S

Date: 3-31-95 Form Completed by: Scott Lane Job Title: Env. Field. Tech.

Total Depth of Well: 30.59' Elevation of Base of Well: Not Surveyed

Initial Water Level (Static) 10.23' Date Measured: 3-30-95 Time: 13:30

Water Level Immediately Following Development 8.65' Date Measured: 3-31-95 Time: 09:40

Water Level Afer Development (Static) 9.06' Date Measured: 3-31-95 Time: 11:10

Method of Development:

	Type	Size	Make
Bailer	S.S.	10' x 1½"	Hydrogroup
Pump	Jet Sub.		Grundfos

Total Development Time: 2hrs. and 30 mins. Surged+ bailed pumped 1hr. and 40min. Total Volume of Water Removed: Bailed approx. 30gal. Pumped 46.5gal. Average Pumping Rate: .75gpm

	Before Pumping				During Pumping				After Pumping			
Date and Time	3-31-95 0955	1013	1020	1025	10:30	10:34	10:38	10:42	10:46	10:50	1053	1057
Volume of Water Removed	1st gal	13.5gal	18.75gal	22.5gal	(SA) ~~6.23~~ 26.25gal	(SA) ~~10.53~~ 29.25gal	32.25gal	35.25 gal.	38.25 gal.	41.25 gal.	43.5 gal.	(SA) 46.5 gal.
Description of Water (Clarity, Particulates, Odor)	cloudy dark brown	cloudy brown	clear	clear	clear	clear	clear	clear	clear	clear	clear	clear
pH	7.1	6.1	6.0	5.9	5.9	5.9	5.9	5.9	5.9	6.0	6.0	6.0
Conductivity	170	140	130	130	130	130	130	130	130	130	130	130
Turbidity	off scale	48.8	18.78	16.24	6.23	10.53	4.82	4.85	3.33	3.43	3.31	3.30
Temperature	12°C	12°C	12°C	12°C	12°C	12°C	12°C	12°C	12°C	12°C	12°C	12°C
Characteristeics of Sediment, Color, Odor, etc.	none	none										none

Volume of Sediment from Last One Liter of Development Water: 0

Description of Containers and Containing Area for Water Removed During Pumping: NA Container Size: NA # of Containers: NA

Volume of Any Added Water: NA Source of Any Added Water: NA For Added Water: Temp, pH, Conductivity, Turbidity: NA

Figure 4-4
Well Development Form
Middletown Airfield Site

Project: USACE Site Name: HIA Location: ERM-30I

Date: 3-30-95 Form Completed by: Scott Lane Job Title: Env. Field. Tech.

Total Depth of Well: Elevation of Base of Well: Not Surveyed

Initial Water Level (Static) Date Measured: Time:

Water Level Immediately Following Development 7.19' Date Measured: 3-30-95 Time: 9:37

Water Level Afer Development (Static) 7.51' Date Measured: 3-30-95 Time: 11:36

Method of Development:

	Type	Size	Make
Bailer			
Pump	Jet Sub.	10' x 1½"	Hydrogroup Grundfos

Total Development Time: Surged/bailed 2hrs. purged w/ pump 1 hr. and 10 min. Total Volume of Water Removed: bailed approx. 20gal pumped 367.5 gal. Average Pumping Rate: 5.5 gpm

	Before Pumping				During Pumping				After Pumping			
Date and Time 3-30-95	1006	1023	1043	1048	10:55	11:00	11:04	11:07	11:11	11:14	11:16	✓
Volume of Water Removed	1st gal.	85 gal.	186 gal.	213.5 gal.	252.0 gal.	279.5 gal.	301.5 gal.	318 gal.	340.0 gal.	356.5 gal.	367.5 gal.	✓
Description of Water (Clarity, Particulates, Odor)	dark cloudy brown	slightly cloudy	slightly cloudy	slightly cloudy	slightly cloudy	slightly cloudy	clear	clear	clear	clear	clear	✓
pH	7.6	7.5	7.5	7.5	7.5	7.5	7.5	7.5	7.5	7.5	7.5	✓
Conductivity	470	440	400	400	390	400	400	400	420	410	410	✓
Turbidity	off scale	44.6	29.6	23.8	31.2	19.69	11.33	9.06	9.72	9.64	9.46	✓
Temperature	14°c	13°c	13°c	14°c	13°c	14°c	14°c	14°c	14°c	14°c	14°c	✓
Characteristeics of Sediment, Color, Odor, etc.	none	→									→	none ✓

Volume of Sediment from Last One Liter of Development Water: 0

Description of Containers and Containing Area for Water Removed During Pumping: NA Container Size: NA # of Containers: NA

Volume of Any Added Water: NA Source of Any Added Water: NA For Added Water: Temp NA, pH, Conductivity, Turbidity

Figure 4-4
Well Development Form
Middletown Airfield Site

Project: USACE Site Name: HIA Location: ERM-31I

Date: 4-24-95 Form Completed by: Scott Lane Job Title: Env. Field. Tech.

Total Depth of Well: 200.19' Elevation of Base of Well: Not Surveyed

Initial Water Level (Static) 15.51' Date Measured: 4-11-95 Time: 08:15
Water Level Immediately Following Development 47.28' Date Measured: 4-11-95 Time: 10:33
Water Level Afer Development (Static) 87.09' Date Measured: 4-11-95 Time: 1314

Method of Development:	Type	Size	Make
Bailer	S.S.	10' x 1½"	Hydrogroup
Pump	Jet Sub.		Grundfos

Total Development Time: Surged and bailed for 2 hrs. and 15min pumped for 2hrs. Total Volume of Water Removed: Bailed approx 25gal, pumped 125 gal. Average Pumping Rate: 1gpm

	Before Pumping				During Pumping				After Pumping			
Date and Time 4-11-95	10:59	11:17	11:29	1141	11:55	1205	12:18	1228	12:46	1254	12:57	1300
Volume of Water Removed	1st gal	18 gal.	30 gal.	42 gal.	61 gal.	80 gal.	93 gal.	103 gal.	111 gal	119 gal.	122 gal.	125 gal.
Description of Water (Clarity, Particulates, Odor)	Cloudy brown	cloudy brown	cloudy brown	cloudy	cloudy	cloudy	Slightly cloudy	Slightly cloudy	slightly cloudy	slightly cloudy	clear	clear
pH	7.2	7.1	7.3	7.2	7.3	7.3	7.7	7.6	7.7	7.8	7.8	7.8
Conductivity	700	700	700	700	700	700	700	750	750	750	750	750
Turbidity	93.4	97.1	102.9	67.6	35.7	33.2	21.6	10 23.3	22.4	14.13	7.74	6.77
Temperature	14°C	14°C	15°C	15°C	15°C	16°C	15°C	15°C	15°C	15°C	15°C	15°C
Characteristeics of Sediment, Color, Odor, etc.	none	none	→								→	none

Volume of Sediment from Last One Liter of Development Water: 0

Description of Containers and Containing Area for Water Removed During Pumping: NA Container Size: NA # of Containers: NA

Volume of Any Added Water: NA Source of Any Added Water: NA For Added Water: Temp, pH, Conductivity, Turbidity: NA

Figure 4-4
Well Development Form
Middletown Airfield Site

Project: USACE Site Name: HIA Location: ERM-32I

Date: 3/16/95 Form Completed by: Scott Lane Job Title: Env. Field. Tech.

Total Depth of Well: 100.08' Elevation of Base of Well: Not Surveyed

Initial Water Level (Static) 10.98' Date Measured: 3/16/95 Time: 0850
Water Level Immediately Following Development 10.68' Date Measured: 3/16/95 Time: 11:16
Water Level Afer Development (Static) 10.26' Date Measured: 3/16/95 Time: 1307

Method of Development:

	Type	Size	Make
Bailer	S.S.	~~5c 10' x 3' x 1 7/8"~~ 10'	Hydrogroup
Pump	Jet Sub.	2 7/8"	Grundfos

Total Development Time: 2 hrs. Surged/bailed pumped 1 hr. 5 min. Total Volume of Water Removed: 36 gal. bailed (approx.) 182 gal pumped Average Pumping Rate: 3.5 gal./min.

	Before Pumping				During Pumping				After Pumping			
Date and Time 3/16/95	1140	1148	1151	1200	1206	1209	1212	1216	1219	1223	1227	1232
Volume of Water Removed (gal.)	1st gal.	28	35.5	70.0	91.0	101.5	112.0	126.0	136.5	150.5	164.5	182 gal
Description of Water (Clarity, Particulates, Odor)	cloudy	clear	→								→	clear
pH	7.4	7.1	7.0	7.1	7.1	7.1	7.0	7.0	7.1	7.1	7.1	7.2
Conductivity	600	900	800	700	700	800	900	800	800	800	800	800
Turbidity	too high to read	6.29	2.71	2.41	2.32	2.73	2.51	3.46	2.51	4.31	3.02	3.02
Temperature	18°C	18°C	→								→	18°C
Characteristeics of Sediment, Color, Odor, etc.	none	→									→	none

Volume of Sediment from Last One Liter of Development Water: 0

Description of Containers and Containing Area for Water Removed During Pumping: NA Container Size: NA # of Containers: NA

Volume of Any Added Water: NA Source of Any Added Water: NA For Added Water: Temp, pH, Conductivity, Turbidity: NA

Figure 4-4
Well Development Form
Middletown Airfield Site

Project: Site Name: Location: ~~AHO~~ RL ERM-320

Date: 8/21/95 Form Completed by: RL Job Title: Field Tech

Total Depth of Well: 294.2 Elevation of Base of Well: 297.25

Initial Water Level (Static) 16.11 Date Measured: 8/21/95 Time: 1005
Water Level Immediately Following Development 30.37 Date Measured: 8/21/95 Time: 1355
Water Level Afer Development (Static) Date Measured: Time:

Method of Development:

	Type	Size	Make
Bailer	PVC	3"	
Pump	Submersibal	2"	Grontos

Total Development Time: 4 HR Total Volume of Water Removed: ~~60~~ RL 8/21/95 680 gal Average Pumping Rate: 5 gpm

	Before Pumping	During Pumping		After Pumping
Date and Time	8/21/95 1140	8/21/95 1315	8/21/95 1355	8/21/95 1435
Volume of Water Removed	10 gal	230	430	630
Description of Water (Clarity, Particulates, Odor)	Slightly Cloudy	Slightly Brown	Clear	Clear
pH	10.8	6.5	6.9	7.0
Conductivity	1700	700	700	700
Turbidity	~~21~~ RL 8/21/95 12.7	45.7	2.1	-2.5
Temperature	21°	20°	20°	20°
Characteristeics of Sediment, Color, Odor, etc.				

Volume of Sediment from Last One Liter of Development Water: water was clear

Description of Containers and Containing Area for Water Removed During Pumping: Pump to Storm Drain Container Size: NA # of Containers: NA

Volume of Any Added Water: N/A Source of Any Added Water: N/A For Added Water: Temp pH Conductivity Turbidity N/A

Figure 4-4
Well Development Form
Middletown Airfield Site

Project: HIA- Middletown Site Name: HIA-Middletown Location: ERM-33I

Date: 3-21-95 Form Completed by: W.N. Fox Job Title: Project Geologist (For. Scott Lane).

Total Depth of Well: 131.96' Elevation of Base of Well:

Initial Water Level (Static) 12.47' Date Measured: 3-21-95 Time: 1245

Water Level Immediately Following Development: Poor-Recovery Date Measured: N/A Time:

Water Level Afer Development (Static) Date Measured: N/A Time:

Method of Development:

	Type	Size	Make
Bailer	2" PVC	2"	—
Pump	Submersible	2"	Grundfos

Total Development Time: + Purge/Bail ≈ 6 hours Total Volume of Water Removed: ≈ 155 Gallons Average Pumping Rate: 1 gal/min.

	Before Pumping	During Pumping						After Pumping
Date and Time	3-21-95 @ 1338	1402	1424	1454	1529	1543	1605	@ 1611
Volume of Water Removed	1 gallon.	24	46	76	102	125	147	153 gallons.
Description of Water (Clarity, Particulates, Odor)	~~Clear~~ Very Turbid	"	cloudy	P. cloudy	"	Turbid	clear	Clear
pH	7.9	7.6	7.2	7.5	7.5	7.6	7.6	7.6
Conductivity	440 umhos	430	420	410	400	390	390	390
Turbidity	Off Scale	"	205	29.7	21.8	23.7	6.84	4.77
Temperature	15.0°C	14°	15	15	15	15	15	15.0°
Characteristeics of Sediment, Color, Odor, etc.	Brown	"	cloudy Brown	NONE →				Clear.

Volume of Sediment from Last One Liter of Development Water: No Sediment

Description of Containers and Containing Area for Water Removed During Pumping: 55 gallon Drums. Container Size: 55 gallon # of Containers: 3

Volume of Any Added Water: N/A Source of Any Added Water: N/A For Added Water: Temp N/A, pH, Conductivity, Turbidity

Figure 4-4
Well Development Form
Middletown Airfield Site

Project: USACE Site Name: HIA Location: ERM-34S

Date: 4-6-95 Form Completed by: Scott Lane Job Title: Env. Field. Tech.

Total Depth of Well: 17.82' Elevation of Base of Well: Not Surveyed

Initial Water Level (Static) 8.88' Date Measured: 4-6-95 Time: 10:00
Water Level Immediately Following Development 8.87' Date Measured: 4-6-95 Time: 12:10
Water Level Afer Development (Static) 8.87' Date Measured: 4-6-95 Time: 16:06

Method of Development:

	Type	Size	Make
Bailer	S.S.	10' x 1½"	Hydrogroup
Pump	Jet Sub.		Grundfos

Total Development Time: surged and bailed for 2hrs. pumped for 1hr 48mins Total Volume of Water Removed: bailed approx. 45gal pumped 253gal. Average Pumping Rate: 3 gpm

	Before Pumping				During Pumping				After Pumping			
Date and Time 4-6-95	9:01	9:18	9:24	9:33	9:38	9:46	9:53	9:57	10:03	10:07	1010	1014
Volume of Water Removed	1st gal.	25.5gal.	34.5gal.	48gal.	55.5gal.	67.5gal.	78gal.	84gal.	93.0gal	99.0gal	103.5gal.	109.5
Description of Water (Clarity, Particulates, Odor)	cloudy reddish dark brown	cloudy reddish brown	clear	clear	clear	clear	clear	clear	clear	clear	clear	clear
pH	7.0	6.6	~~6.6~~ 6.7	6.6	6.6	6.6	6.7	6.6	6.6	6.6	6.6	6.6
Conductivity	500	500	500	500	500	500	500	500	500	500	500	510
Turbidity	off Scale	63.1	18.30	8.32	5.76	4.87	7.10	5.46	4.51	3.96	3.72	3.79
Temperature	12°c	12°c	12°c	12°c	12°c	12°c	12°c	12°c	12°c	12°c	12°c	12°c
Characteristeics of Sediment, Color, Odor, etc.	none	→									→	none

Volume of Sediment from Last One Liter of Development Water: 0

Description of Containers and Containing Area for Water Removed During Pumping: NA Container Size: NA # of Containers: NA

Volume of Any Added Water: NA Source of Any Added Water: NA For Added Water: Temp, pH, Conductivity, Turbidity: NA

Figure 4-4
Well Development Form
Middletown Airfield Site

Project: USACE Site Name: HIA Location: ERM-34I

Date: 4-24-95 Form Completed by: Scott Lane Job Title: Env. Field Tech

Total Depth of Well: Elevation of Base of Well: Not Surveyed

Initial Water Level (Static) 8.72' Date Measured: 4-10-95 Time: 08:15
Water Level Immediately Following Development 8.72' Date Measured: 4-10-95 Time: 10:22
Water Level Afer Development (Static) 8.86' Date Measured: 4-10-95 Time. 11:44

Method of Development:

	Type	Size	Make
Bailer	SS.	10' x 1½"	Hydrogroup
Pump	Jet Sub.		Grundfos

Total Development Time: Surged/bailed 2 hrs and 2 mins. pumped for 40 min. Total Volume of Water Removed: bailed 22 gal. pumped 140 gal. Average Pumping Rate: 3.5 gpm

	Before Pumping				During Pumping				After Pumping			
Date and Time 4-10-95	1045	1057	1100	1104	1108	1112	1116	1121	1125			
Volume of Water Removed	1st gal.	42 gal	52.5 gal.	66.5 gal.	80.5 gal.	94.5 gal	108.5 gal gal.	126 gal	140 gal			
Description of Water (Clarity, Particulates, Odor)	cloudy	clear	clear	clear	clear	clear	clear	clear	clear			
pH	7.4	7.3	7.2	7.4	7.2	7.3	7.3	7.2	7.3			
Conductivity	600	600	650	650	650	650	650	650	650			
Turbidity	29.7	3.21	1.97	1.77	1.98	1.51	1.63	1.30	1.51			
Temperature	14°c	14°c	14°c	14°c	14°c	14°c	14°c	14°c	14°c			
Characteristeics of Sediment, Color, Odor, etc.	none	none	none	none	none	none	none	none	none			

Volume of Sediment from Last One Liter of Development Water: 0

Description of Containers and Containing Area for Water Removed During Pumping: NA Container Size: NA # of Containers: NA

Volume of Any Added Water: NA Source of Any Added Water: NA For Added Water: Temp, pH, Conductivity, Turbidity: NA

Figure 4-4
Well Development Form
Middletown Airfield Site

Project: USACE Site Name: HIA Location: ERM-35S

Date: 4-24-95 Form Completed by: Scott Lane Job Title: Env. Field Tech.

Total Depth of Well: 19.37' Elevation of Base of Well: Not Surveyed

Initial Water Level (Static) 11.57' Date Measured: 4-6-95 Time: 16:30
Water Level Immediately Following Development 11.68' Date Measured: 4-7-95 Time: 8:42
Water Level Afer Development (Static) 11.67' Date Measured: 4-7-95 Time: 10:34

Method of Development:

	Type	Size	Make
Bailer	S.S.	10' x 1½"	Hydrogroup
Pump	Jet Sub.		Grundfos

Total Development Time: surged/bailed for 2hr. 30mins. pumped for 1hr. 13mins Total Volume of Water Removed: bailed 31 gals. pumped 109.5 gals. Average Pumping Rate: 1.5 gal. p.m

	Before Pumping				During Pumping				After Pumping			
Date and Time 4-7-95	09:01	09:18	09:30	09:36	09:43	09:48	09:57	10:03	10:05	10:07	10:10	10:14
Volume of Water Removed	1st. gal	25.5 gal	43.5 gal.	52.5 gal.	63.0 gal.	70.5 gal.	84.0 gal.	93.0 gal.	96.0 gal.	99.0 gal	103.5	109.5 gal.
Description of Water (Clarity, Particulates, Odor)	cloudy dark reddish brown	cloudy reddish brown	cloudy	clear	clear	clear	clear	clear	clear	clear	clear	clear
pH	7.0	6.6	6.6	6.6	6.6	6.6	6.6	6.6	6.6	6.6	6.6	6.6
Conductivity	500	500	500	500	500	510	500	500	500	500	500	510
Turbidity	off scale	63.1	10.88	7.66	5.10	5.03	5.46	4.51	3.93	3.96	3.72	3.79
Temperature	12°c	12°c	12°c	12°c	12°c	12°c	12°c	12°c	12°c	12°c	12°c	12°c
Characteristeics of Sediment, Color, Odor, etc.	none											

Volume of Sediment from Last One Liter of Development Water: 0

Description of Containers and Containing Area for Water Removed During Pumping: NA Container Size: NA # of Containers: NA

Volume of Any Added Water: NA Source of Any Added Water: NA For Added Water: Temp, pH, Conductivity, Turbidity: NA

Figure 4-4
Well Development Form
Middletown Airfield Site

Project: USACE Site Name: HIA Location: ERM-35I

Date: 4-25-95 Form Completed by: Scott Lane Job Title: Env. Field Tech.

Total Depth of Well: 100.09' Elevation of Base of Well: Not Surveyed

Initial Water Level (Static) 11.55' Date Measured: 4-10-95 Time: 13:36
Water Level Immediately Following Development 11.92' Date Measured: 4-10-95 Time: 15:52
Water Level Afer Development (Static) 13.24' Date Measured: 4-10-95 Time: 17:50

Method of Development:

	Type	Size	Make
Bailer	S.S.	10' x 1½"	Hydrogroup
Pump	Jet Sub.		Grundfos

Total Development Time: Surged/bailed for 2hrs. pumped for 1hr and 24min. Total Volume of Water Removed: bailed 25 gal. pumped 349 gal. Average Pumping Rate: 4gpm

	Before Pumping				During Pumping				After Pumping			
Date and Time 4-10-95	16:09	16:24	16:38	1649	1656	1706	1716	1722	1731	1735	1739	1744
Volume of Water Removed	1st gal.	45 gal.	87 gal.	125 gal	153 gal	193 gal.	233 gal.	257 gal	293 gal.	309 gal	325 gal	345 gal
Description of Water (Clarity, Particulates, Odor)	cloudy dark reddish brown	cloudy reddish brown	cloudy reddish brown	cloudy reddish brown	cloudy reddish brown	cloudy reddish brown	slightly cloudy	slightly cloudy	clear	clear	clear	clear
pH	7.9	7.8	7.8	7.8	7.9	7.9	7.8	7.8	7.8	7.8	7.8	7.8
Conductivity	430	480	440	430	430	430	430	430	430	430	430	430
Turbidity	off scale	91.2	67.4	81.8	59.5 59.7	57.5	13.79	14.32	12.99	12.62	12.52	12.59
Temperature	13°c	14°c	14°c	14°c	14°c	14°c	13°c	14°c	14°c	14°c	14°c	14°c
Characteristeics of Sediment, Color, Odor, etc.	none											none

Volume of Sediment from Last One Liter of Development Water:

Description of Containers and Containing Area for Water Removed During Pumping: NA Container Size: NA # of Containers: NA

Volume of Any Added Water: NA Source of Any Added Water: NA For Added Water: NA
Temp
pH
Conductivity
Turbidity